PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY.

VOL. VI. JULY—DECEMBER, 1858. No. 60.

Stated Meeting, July 16, 1858.

Present, six members.

Dr. DUNGLISON, Vice-President, in the Chair.

The following donations were announced:—

FOR THE LIBRARY.

Report of the Joint Select Committee, on the Wisconsin Land Frauds. Madison, 1858. (320 pages.) 8vo.—*From the Committee.*

Monthly Notices of the Royal Astronomical Society. XVIII. 7. London. May 14, 1858. 8vo.—*From the Society.*

Albany Astron. Journal. No. 114.—*From the Editor.*

American Jour. Med. Sciences. LXXI. July, 1858. Philadelphia.

Medical News and Library. No. 187.—*From Blanchard & Lea.*

American Jour. Science and Art. July, 1858.—*From the Editors.*

Reports of the Board of Visitors, &c. of the New Hampshire Asylum for Insane. Concord, 1858. (22 pages.) 8vo.—*From the Board.*

Proceedings Boston N. H. Soc. (23.)—*From the Society.*

Journal Franklin Institute. July, 1858.—*From the Institute.*

United States Astronomical Expedition. Vol. III. Solar Parallax Obs. Washington, 1856. 4to.—*From Sup't J. M. Gilliss.*

The death of the Hon. Job R. Tyson, a member of the Society, was announced as having occurred on the 27th of last month, in the 55th year of his age.

Johannes Müller, of Berlin, a member of the Society, was also announced as deceased.

Stated Meeting, August 20, 1858.

Present, five members.

The Vice-Presidents being absent, Mr. Justice was called to the Chair.

Letters were read:—

From the Royal Society of London, dated March 13, 1858, and from the Royal Geographical Society, dated December 30, 1857, respectively acknowledging the receipt of the Transactions of this Society, Vol. XI. Part 1, and of the Proceedings, Nos. 55 and 56: and—

From the Royal Geographical Society, dated April 20, 1858, announcing a donation for the library.

The following donations were announced:—

FOR THE LIBRARY.

Addresses of the newly appointed Professors of Columbia College. New York, 1858. (200 pages.) 8vo.—*From the College.*

Journal of the Proceedings of the 74th Pennsylvania Episcopal Diocesan Convention. Philadelphia, 1858. (200 pages.) 8vo.—*From Jas. J. Barclay.*

Report of the Managers of the Episcopal Church Hospital. Philadelphia, 1858. (40 pages.) 8vo.—*From the same.*

Third Annual Report of the Wisconsin Hist. Soc. Vol. III. Madison, 1857. (550 pages.) 8vo.—*From the Society.*

Tenth Annual Report of the Maryland Institute. Baltimore, 1858. (233 pages.) 8vo.—*From the Institute.*

Defence of Dr. Gould, by the Scientific Council of the Dudley Observatory. Albany, 1858. (92 pages.) 8vo.—*From A. D. Bache*

Thirty-seventh Annual Report, Mercantile Library and Clinton Hall Association. New York, 1858. (40 pages.) 8vo.—*From the Ass.*

Philosophical Trans. Royal Soc. London. Vol. 147. Parts 1, 2.

Proceedings of the same. VIII. 27: IX. 28, 29; with the List of Officers and Fellows, Nov. 30, 1857; with the Anniversary Address of the President.—*From the Society.*

Monthly Notices, Royal Astron. Soc. XVII. XVIII. No. 8.

Memoirs of the same. Vol. XXVI. London, 1858.—*From the Soc.*

Journal Royal. Geog. Soc. XXVII. London, 1857. 8vo. and

Proceedings of the same. II. No. 1, 2. Jan. March, 1858.

Report of the Adjudication of the Copley, Rumford and Royal Medals and appointment of the Bakerian, Croonian and Fairchild lectures, compiled from the original Documents in the Royal Society, by James Hudson, Asst. Sec. and Librarian. London, 1834. 4to. —*From the Royal Society.*

Six Discourses before the Royal Soc. at the awarding of the medals, preceded by an address by Sir Humphrey Davy. London, 1827. 4to.—*From the Royal Society.*

Observations Meteorologiques à Nijné Taguilsk. Paris, 1858. 8vo.

Journal Soc. Arts and Inst. in Union. VI. 276–279. London, 1858.

Journal Bath and West of England Soc. London, 1857. 8vo.

Journal Royal Dublin Soc. Nos. 7 and 8. 8vo.—*From the Society.*

Journal Franklin Institute. XXXVI. 2. Philadelphia, 1858. 8vo.

Catalogue of Antiquities in the Royal Irish Acad. Museum, by W. R. Wilde, illustrated. Dublin, 1857. (250 pp.) 8vo.—*From W. R. W.*

Bulletin Soc. de Geographie. T. XV. Paris, 1858. 8vo.

Medical News and Library. XVI. 188. Philadelphia, 1858. 8vo. —*From Blanchard & Lea.*

Experiments on Sonorous Flames by W. B. Rogers. From the Amer. Jour. (15 pages.) New Haven, 1858. 8vo.—*From the Author.*

The Dudley Observatory, an address to the citizens of Albany, &c. 1858. (32 pages.) 8vo.

Dr. Harris announced the decease of William Rawle, Esq., a member of the Society, who died on the 9th of the present month, in the 71st year of his age.

Mr. Lesley laid before the meeting some specimens of slate from the second coal bed of Broad Top, containing *Lepidostrobus*, which he considers important as establishing the identity of this coal bed at different points of its many outcrops in widely distant parts of the United States. In connection with this he also exhibited specimens of top-slate, polished to a perfect mirror surface by the disturbance of the coal bearing strata.

On motion of Mr. Letchworth, an appropriation of forty dollars was made to pay expenses incurred by the Librarian.

Stated Meeting, September 17, 1858.

Present, fourteen members.

Dr. DUNGLISON, Vice-President, in the Chair.

Letters were read:—

From Dr. Thomas Horsfield, dated Library, India House, August 28, 1858, announcing a donation for the library, from the Hon. Directors of the India Company, London:—

From Mr. Charles F. Loosey, dated New York, August 19, 1858, announcing the transmission of a donation for the library from the I. R. Geographical Society of Vienna: and—

From M. Alfred Malherbe, dated Metz, August 4, 1858, accompanying a prospectus of his "Monographie des Piscides," for which he solicits the patronage of the Society and its members.

The following donations were announced:—

FOR THE LIBRARY.

Mittheilungen der K. K. Geogr. Ges. I. 1, 2. Wien, 1857. 8vo.
Proceedings Amer. Acad. IV. (1) to (11). Boston, 1858. 8vo.
Proceedings Boston Soc. N. H. VI. (24). 1858. 8vo.
Journal Franklin Institute. No. 393. Philadelphia, 1858. 8vo.
Amer. Journal Sci. XXVI. No. 77. New Haven, 1858. 8vo.
Medical News. XVI. No. 189. Philadelphia, 1858. 8vo.
Minutes of Gen. Ass. Connecticut. New Haven, 1858. 8vo.
Bulletin, Soc. de Geógraphie. T. XV. Paris, 1858. 8vo.
Proceedings at the Dedication of the Boston Public Library Building. Jan. 1, 1858. Boston. 8vo.—*From the City of Boston.*
Map of the Basin of the La Plata.—*From the Navy Department.*

On motion of Dr. William Harris, it was resolved that Dr. Robert E. Rogers be requested to prepare an obituary notice of the late Dr. Robert Hare.

A paper, entitled "A List of Fifteen Hundred English-Sanscrit Analogues, by Pliny Chase," was offered for publication in the Transactions of the Society, which was referred to a committee consisting of Mr. Lesley, Prof. Coppée and Judge King.

On motion of Dr. Le Conte, the Librarian was instructed to furnish a statement of the list of exchanges of the Society, and the value thereof.

The Reporter laid upon the table No. 59 of the Proceedings of the Society, which has been recently published.

Stated Meeting, October 1, 1858.

Present, fourteen members.

Prof. CRESSON, Vice-President, in the Chair.

Letters were read:—

From the Society of the Museum of Natural History, of Strasbourg, dated March 5, 1857, acknowledging the receipt of Nos. 53 and 54 of the Proceedings of this Society:—

From the Literary and Philosophical Society of Manchester, without date, returning thanks for Vol. XI. Part 1, of the Transactions, and Nos. 55 and 56 of the Proceedings:—

From the Connecticut Historical Society, dated Hartford, Sept. 23; from the Corporation of Yale College, dated New Haven, Sept. 24; and from the Academy of Science of St. Louis, dated Sept. 24, 1858, severally containing acknowledgments for No. 59 of the Proceedings: and—

From Prof. Zantedeschi, dated Padua, Sept. 9, 1858, in relation to the mode of forwarding letters and communications to him.

The following donations were announced:—

FOR THE LIBRARY.

Forty-third Annual Report, American Asylum for Deaf and Dumb. Hartford, 1858. (60 pages.) 8vo.—*From the Conn. Hist. Soc.*

Thirty-fourth Ann. Report, Retreat for the Insane.—*From the same.*

History of the Indian Tribes, by H. R. Schoolcraft. Part VI. of the Series. Phila. 1857. (754 pp.) 4to.—*From Commiss. C. E. Mix.*

Principles of Social Science. Vol. II. By H. C. Carey. Philadelphia, 1858. 8vo.—*From the Author.*

Quarterly Journal, Chem. Soc. XI. 2. London, 1858. 8vo.

Letter to the Majority of the Trustees of the Dudley Observatory, by an Observer. Albany, 1858. 8vo.
Journal Soc. Arts. VI. 276–279. London, 1858. 8vo.

The committee to which was referred the paper of Mr. Chase, read at the last meeting, made request that Prof. Haldeman be added to the committee, which was agreed to.

The committee appointed on the 7th of May last, on the subject of further Arctic explorations, by Dr. I. I. Hayes, made the following report:—

The committee to whom was referred the subject of the Arctic exploration proposed by Dr. I. I. Hayes, respectfully report,—

That, beside any reflections of their own upon that subject, they find in previous proceedings of the Society ample warrant for the opinion, that the verification of the alleged open sea about the north pole, and the probable contributions to be made from that region of the earth to the collections of science, constitute sufficient reasons for an earnest interest on the part of the Society, in any reasonable attempt to complete our knowledge in these respects by further exploration. After the signal manifestations which have been given by men of science throughout the world, of their estimate of the importance of circumpolar discovery; and with the advantage of recent reports, from a high latitude, received from our lamented fellow member, the late Dr. Kane, whose efforts were accompanied by warm solicitude on the part of the Society, your committee have believed it proper to confine themselves to a consideration of the grounds upon which Dr. Hayes rests his conviction of the practicability and seasonableness of his proposal. These have been already briefly submitted to the American Association for the Advancement of Science, and have received a very prompt acceptance by that body, the members of which referred the subject to a committee, with instructions to cooperate with Dr. Hayes. They have been also published through the Smithsonian Institution, at an invitation from which, Dr. Hayes announced them in one of the lectures of its last course. Nevertheless, your committee think proper to mention the principal of them as forming the basis of their own conclusion, that the proposal in question is sustained by sufficient evidence of its feasibility to engage the continued attention of the Society.

It is well known that one result of voyages of exploration prior to that of Dr. Kane, was the establishment of an opinion that a barrier

of ice surrounded the pole; and that in order to reach open water, if such existed, a way must be found through, or over, the barrier. Dr. Kane, after an intelligent consideration of the discoveries already reported, aided by the illustrations derived from his personal observation during his first visit to the Arctic circle, concluded that the most practicable course lay up Smith's Strait, which he accordingly followed upon his second vopage. The difficulties encountered by him were such, that after many gallant efforts, he was compelled to return to the United States without becoming an eye witness to the physical condition of the region towards which his labours tended. It seemed therefore proper for your committee to inquire whether those difficulties were clearly of so constant a nature in relation to all similar attempts, as to render it prudent on the part of the Society to avoid encouragement of a project which his experience may have shown to be impracticable. It appears that the most important impediments to his complete success were—1st. The arresting of his vessel and her permanent confinement by the ice, in a situation which was unfavourable to the efforts of his exploring parties. This occurred in a bay to the south of Kennedy channel, with an exposure to the main pressure of ice, which accumulated in hummocks on the north of his position; and thus the labour necessary to any exploration towards the pole, was in disproportion to the strength of his crew, and the resources at his command. On the west side of the channel, under the cover of the projecting land visited by Dr. Hayes (to the most prominent point of which the name Cape Frazer was given), the ice is reported as free from the impediments above stated; and a good harbour is reported to exist for wintering a ship, with egress by the opening of the channel, or through leads in the ice during the Arctic summer. The account published by Dr. Kane, shows how large a proportion of the sufferings and disappointments of his exploring parties was due to the position into which he was forced.

2d. The want of fresh provisions. The unavoidable delay of Dr. Kane's departure from New York beyond the period proposed by him, prevented his collecting, near the Danish settlements in Greenland, the fresh stores which abound in that neighbourhood. Originally contemplating a single year's work, he was detained beyond his expectation, with scanty supplies, until his men, worn out by excessive labour and restricted mainly to a salt diet, became the victims of fearful assaults of scurvy. His narrative shows how much of his disappointment is due to this cause. His dogs, indispensable auxiliaries, were unable to subsist upon salted meats; and thus the entire

stress of the work fell upon an ill-conditioned ship's company. Dr. Hayes proposes to give two years to his exploration. The first of these he designs to employ in reaching his head quarters at or near Cape Frazer; and in establishing thence northward, on the west side of Kennedy channel, secure depôts of provisions, as far as the latitude assigned by Morton to the open water reported by him, or further, if necessary; and in explorations preliminary to the main attempt. The second year, or such portion of it as may be sufficient, Dr. Hayes appropriates to the ascertainment of the condition of the polar adjacencies, and to such observations as may be most important to science. Thus the expedition of Dr. Kane, which may seem to discourage further attempts in the same direction, is viewed by Dr. Hayes as really furnishing the knowledge which promises final success. Your committee concur in this view.

In such circumstances, your committee cannot doubt that it is proper for the American Philosophical Society to co-operate with Dr. Hayes, in such manner as may be conformable with its usages in like cases; and especially to give to him the benefit of such systematic instruction as may best further the general purposes of the Society in the discovery and diffusion of useful knowledge.

Your committee respectfully submit the following resolution:—

Resolved, That a committee of nine members of the Society be appointed to co-operate with Dr. Hayes in his proposed extension of Arctic exploration, and to give to him, on the part of the Society, such instructions as may best promote its objects.

All of which is respectfully submitted.

The resolution accompanying the report was adopted, and the presiding officer authorized to appoint the committee, and announce it at a future meeting.

Mr. Justice referred to the comet which is now visible, and inquired whether any of the members had observed prismatic colours in the *coma;* stating that he thought he had distinctly observed a greenish hue, tinged with rose-colour, on several occasions.

Prof. Cresson remarked that he had observed a reddish tinge; and other members spoke of the appearances presented during their observations of the comet.

Mr. Lesley called the attention of the members to some specimens of photo-lithography, executed by Mr. Rehn, of Phila-

delphia, from photographic impressions made directly upon the stone. Mr. L. referred to the uses to which this process may be applied; its fidelity, and its cheapness as compared with other modes of obtaining copies of objects in natural history, and for other purposes.

A vacancy having occurred in the committee on the bequest of the late F. A. Michaux, by the death of Judge Kane, it was resolved that Judge King be appointed in his place, and that the committee be directed to communicate with M. Hector Bossange, of Paris, in relation to the legacy bequeathed to the Society by M. Michaux.

Stated Meeting, October 15, 1858.

Present, twenty-one members.

Prof. CRESSON, Vice-President, in the Chair.

Letters were read:—

From the Department of State, dated Washington, Oct. 9, 1858, accompanying a donation for the Library of the Society: and—

From the Historical Society of Massachusetts, dated Boston, Oct. 1, 1858, acknowledging the receipt of the Society's Proceedings, No. 59.

The following donations were announced:—

FOR THE LIBRARY.

Paraguay and Uraguay Sheet Maps. Nos. 8, 9, 1, 2, and reference chart.—*From the U. S. Navy Department.*

American Journal Med. Sci. Oct. 1858, and

Medical News, No. 190.—*From Blanchard & Lea.*

Diocesan Miss. Soc. First, Fourth and Fifth Annual Meetings. Philadelphia, 1853'4'7'8. 8vo.—*From Jas. J. Barclay.*

Episcopal Miss. Ass. for the West. Annual Reports for 1856'8. 8vo.

Hospital of the P. Epis. Church. Annual Reports for 1856'7'8. 8vo.

Appeal of the Friends in behalf of the Coloured Races. Philadelphia, 1858. (48 pages.) 8vo.—*From the same.*

Dudley Observatory, Statement of Trustees. Albany, 1858. 8vo.
Journal Franklin Institute. Philadelphia, Oct. 1858. 8vo.

The Society then proceeded to ballot for candidates for membership.

In accordance with the resolution passed Sept. 17, the Librarian presented a statement of the annual exchange list of the Society, viz.—The number of pages annually presented to the American Philosophical Society as *donations*, amounts, at present, to about one-third of the number presented as *exchanges;* the nearest estimate of which is as follows: 12mo. 1000; 8vo. 35,000; 4to. 17,000: equivalent, in volumes, to 5, 120, 45; and in money, say to $10, $600, $340; total, $950. There stand, upon the donation book, about 340 titles of works received since this date last year, of which one-fourth (95) are donations, and not exchanges.

All other business having been concluded, the ballot boxes were opened, and the following named gentlemen were declared to be duly elected members of the Society:—

Dr. William M. Uhler, of Philadelphia.

Mr. Charles E. Smith, of Philadelphia.

Dr. Edward Hartshorne, of Philadelphia.

Stated Meeting, November 5, 1858.

Present, ten members.

The Vice-Presidents being absent, Dr. Franklin Bache was called to the chair.

Dr. W. M. Uhler, a recently elected member, was introduced and took his seat.

Letters were read:—

From Charles E. Smith, dated Philadelphia, Oct. 25; from Dr. Edward Hartshorne, dated Oct. 28; and from Dr. Wm. M. Uhler, dated November 1, 1858, severally acknowledging the receipt of notice of their election as members of the Society.

The following donations were announced:—

FOR THE LIBRARY.

Compte Rendu d'un ouvrage inédit de M. Roehrig, intitulé Researches in Philosophical and Comparative Philology, chiefly with reference to the languages of Central Asia, par M. L. Dubeux. Paris, 1850. (27 pages.) 8vo.—*From F. L. O. Roehrig.*

Catalogue of Harvard University for 1858–9. Cambridge, 1858. 8vo.

Astronomical Journal. No. 117.—*From B. A. Gould.*

U. S. Naval Astron. Exped. Vols. III. VI. Executive Documents.

U. S. Pacific R. R. Explor. Vols. II. III. IV. V. VI. VII. VIII. 4to.

U. S. Japan Exped. Narrative of Com. Perry. Vol. II. 4to.

U. S. Pacific Rail Road Surveys. Vols. II. to VIII. Senate Doc.

U. S. Japan Exped. Narrative. Vol. II. Washington, 1856. 4to.

Geology of Pennsylvania, Final Report. Vol. I. By H. D. Rogers, with Maps. Phila. 1858. (586 pages.) 4to.—*From Sec. of Com.*

Massachusetts House Documents. School for Idiots, Report for April 28, 1857. Boston. (32 pp.) 8vo.—*From Dr. Ed. Jarvis.*

Worcester State Lun. Asy. Twenty-fourth An. Rep. Bost. 1857. 8vo.

Mass. Gen. Hospital. Reports for 1851–2–4–6. Boston. 8vo.

Mass. Blind Asylum. Twenty-sixth An. Report. Boston, 1858. 8vo.

Taunton State Lunatic Hospital. Fourth An. Rep. Bost. 1857. 8vo.

Mass. Idiot School. Tenth Annual Report. Boston, 1858. 8vo.

Tendency of Misdirected Education to produce Insanity, by Dr. Ed. Jarvis. (From Barnard's Jour. 20 pages.) Boston, 1858. 8vo.

Mass. State Almshouse at Bridgewater. 4th An. Rep. Bost. 1857. 8vo.

Medical Communications of the Mass. Med. Soc. VIII. 5, IX. 1, 2. Boston, 1856'5'6. (250 pages.) 8vo.—*From Dr. Ed. Jarvis.*

Annual Report Adj. Gen. of Mass. Boston, 1857. (76 pp.) 8vo.

Abstracts of returns from Mass. Banks, &c., prepared by Francis De Witt, Sec. Com. Boston, 1857. (130 pages.) 8vo.

Finances of Dorchester. Eighteenth An. Report Boston, 1856. 8vo.

Census of Legal Voters in Massachussetts. Boston, 1857. 8vo.

Census of Boston, Mass. Report of J. Curtis. 1856. 8vo.

Boston City Registrar's Report. (55 pages.) 1858. 8vo.

Mass. Loan and Fund Ass. Second Annual Report. 1858. 8vo.

Boston Public Library Report. (23 pages.) 1852. 8vo.—*All the above from Dr. Ed. Jarvis.*

Monthly Notices Royal Astron. Soc. XVIII. 9. London, 1858. 8vo.

Cours d'Economie politique fait au College de France, par Michel

Chevalier. Vol. II. Sec. Edit. enlarged. Paris, 1858. (630 pages.) 8vo.—*From the Author.*

Eléments de la Grammaire Turque a l'usage des élèves de l'ecole impériale et spéciale des langues orientales vivantes, par Louis Dubeux. Paris, 1856. 12mo.—*From the Author.*

Catalogue of the Lepidopterous insects in the Museum of the Hon. E. India Co. by Thos. Horsfield. Vol. I. London, 1857. (276 pages.) 8vo. With plates.—*From the Author.*

Catalogue of the Birds. Vol. II. (Vol. I. was published in 1854.) London, 1856–8. (300 pages.) 8vo.—*From the Company.*

Report of the Supt. of Education for L. Canada for 1856; translated. Toronto, 1857. (230 pages.) Large 8vo.—*From Capt. Latour.*

Report on the Chemical Analysis of the White Sulphur Water of the Artesian Well at Lafayette, Indiana, &c. By C. M. Wetherell. Lafayette, 1858. (31 pages.) 8vo.—*From the Author.*

At his request, Mr. Ord was excused from preparing an obituary notice of Charles L. Bonaparte, Prince of Canino, late a member of the Society.

Dr. F. Bache announced the death of Parker Cleaveland, LL.D., a member of the Society, who died at Brunswick, Maine, on the 15th ultimo, aged 78.

An amendment to the laws of the Society was offered by Dr. F. Bache, viz.—Repeal that clause of the third section of Chap. II. which reads as follows: "but no person shall be eligible to election as President at more than two out of any three successive elections:" which amendment was laid over for consideration at the next stated meeting.

Stated Meeting, November 19, 1858.

Present, twenty-seven members.

Dr. Dunglison, Vice-President, in the Chair.

Letters were read:—

From Lieut. Col. Henry James, of the Royal Engineers, dated Ordnance Survey Office, Southampton, Oct. 30, 1858,

announcing a donation for the library from the British Government: and—

From Prof. Zantedeschi, dated Padua, Oct. 28, 1858, accompanying a communication "On the polarized light of comets, of their probable nature, and of the atmosphere of the planets."

Della luce Polarizzata delle comete, della sua Probabile natura e della atmosfera di pianeti.

MEMORIA DEL PROFESSORE FRANCESCO ZANTEDESCHI.

Fino dal 1846 io mi era occupato delle leggi della luce polarizzata dell'atmosfera serena; e nello stesso anno io publicava nella mia Raccolta Fisico-Chimica Italiana due memorie, che portano il titolo:

I. Delle leggi dell'intensità della polarizzazione della luce lunare nell'atmosfera serena.

II. Delle leggi dell'intensità della polarizzazione della luce solore nell'atmosfera serena.

Si vegga della Raccolta suddetta il T. I. pag. 429–453; Venezia co'tipi di Guiseppe Antonelli 1846.

Di queste due memorie io non referiro quì i risultamenti finali, ai quali sono pervenuto; avvegnachè essi potranno ancora leggersi nella *Lumière*. Dirò solo, che io mi era prefisso di fare le seguenti ricerche: i massimi ed i minimi dell'intensità della luce polarizzata da me osservati, hanno una relazione costante colla posizione del sole e della luna in tutte le epoche dell'anno? I punti detti neutri sono veramente tali, ovvero sono i minimi dell'intensità della luce polarizzata. Ossia i limiti dei colori complementori di due piani normali di polarizzazione, quali si presentarono alle mie indagini? Hanno essi punti neutri una distanza costante fra di loro, ed un rapporto constante colla posizione degli astri radianti? Il loro numero è costante in qualsivoglio epoca dell'anno? Non varia neppure nell'eclissi solore e lunare nelle quali epoche cangiano le quantità della luce diretta e riflessa? Ecco la somma delle indagini, che mi era prefissa e all'insieme di queste mie investigazioni era stato stimolato in Parigi da Babinet nel 1852 e susseguentemente nel 1855; una la mia vista aveva perduto di quella acutezza penetrante che possedeva; e perciò io desistetti da queste esperienze, nelle quali non avrei potuto portare quella precisione di confronto, che addimandavano le precedenti. E perciò mi rivolsi all'opera intelligente dè mia amici, i quali da più mesi in Italia e fuori si stanno occupando con assiduità di queste investigazioni.

Surse frattanto nel 1858 sul nostro orizzonte a fare vaga e lu-

minosa comporsa la cometa di Pons del 1827, alla quale richiamò per il primo l'attenzione l'astronomo Donati di Firenze ritenuta come nuova da lui, dal Santini; ma non come tale dal Corlini, da Bond e da altri. Io vidi una bella occasione, che mi presentava la natura a ripetere l'originale scoperta dell'insigne Arago, il quale nel suo Tratatto di Astronomia intitolato, *Lezioni* ebbe a scrivere; "Le esperienze ebbero effetto il 23 Ottobre del 1835 e ne risulto che la luce dell'astro non era, almeno in totalita, composta di raggi dotati delle proprietà della luce diretta, propria o assimilata; vi si trovava della luce riflessa specularmente o polarizzata, cioè a dire, definitivamente della luce proveniente dal sole." (Arago Lezioni di Astronomi tradotte ed annotate di E Capocci Napoli anno 1852 per Francesco Rossi, editore, pag. 386).

I miei amici d'Italia e di altre Alpi mi assicurarono, da me pregati, di occuparsi anche di questa osservazione; e fra essi il Sig. Professore Cirito Ronzoni mi ebbe a scrivere graziosamente la seguente lettera:

"Avendo io adoperato da principio il polariscopio di Savart *a bande* che la di lei gentilezza mi prestò pelle ricerche sulla polarizzazione atmosferica, e poi un altro polariscopio foggiato a modo di quello *detto a colori* di Arago, non ebbi si coll'uno che coll'altro se non se mal sicuri indizj di polarizzazione, anche quando il campo dell'atmosfera era il più puro pel lurgo ond'io osservava; il perchè mi venne in mente che meglio sarebbe stato cercare un polariscopio attraverso del quale la luce polarizzato, ove esistesse, non avesse a dare, ad ogni quarto di giro, che delle decise alternative di *chiaro e di scuro*, e come tale mi si offerse spontaneamento una eccellente laminetta sottile di *tormalina* parallela, che apportiene al Gabinetto di Fisica di questo R. Ginnasio Liceale. Con questa io potei verificare in modo deciso, fino della sera del *b* corrente l'esistenza di luce polarizzata nel nucleo come nella coda della cometa e potei di più accertarmi che nel nucleo il piano di polarizzazione era diretto nel senso secondo cui si spicca la coda del medesimo. Il Sig. Professore Luigi Dr. Cattaneo, che mi si associò gentilmente alle osservazioni, ebbe ad affermarmi di avere egli pure verificato quanto di sopra io scrissi d'avere osservato. Egli poi notò per di più questo fatto che potrebbe anche dirsi legge nei limiti dell'osservazione, che cioè, collocando successivamente in varii punti l'asse della tormalina tangenzialmente all'arco di curva che contermina la coda della banda australe, resta di mano in mano più visibile le parte dell'astro, compresso il nucleo, la quale rimane al disotto del punto di contatto, per cui deve inferirsi che il piano di po-

larizzazione della luce la quale emana dal suddetto arco di curva congio da punto a punto, e contiene la tangente a questa curva.

Padova li 8 *Ottobre*, 1858. *Ore* 10 *P. M.*"

Susseguentemente alle comunicazione di questa lettera venni da parecchie persone assicurato, che il colore e l'intensità della luce della coda della cometa non era costante; ma che presentava taloro delle forti variazioni da sembrare quasi una luce fosforescente, che per inter valli si avviva e per intervalli s'infievolisce. Nella sera del giorno 11 di questo mese di Ottobre, il fenomeno si presentò in un modo il più cospicuo. Di questi intervalli o periodi si valse il Sig. Professore Ronzoni, per assaggiare il polariscopio a bande di Savart; e tenutolo col piano di polarizzazione orizzontale, vide distintamente le bande, che intersecavano la coda nella sua lunghezza. Le variazioni d'intensità della luce della coda, da rinscire quasi impercettibile, furono avvertite anche in Parigi, come emerge da una comunicazione fatta dal Sig. Bulard alla Accademia delle Scienze nel giorno 20 di Settembre di quest'anno. La scoperta in pertanto dell'Arago fu anche in questa circostanza pienamente confermata in Italia e per quanto sono assicurato, anche in Francia ed in altre contrade d'Europa.

Quale è la natura della luce delle comete? Le osservazioni riferite ci autorizzano ad ammettere che sia luce proveniente direttamente dal sole e riflessa specularmente dalla materia vaporosa della coda della cometa. Viene in conferma di questa sentenza l'osservazione delle fasi riferita dal Cassini ed ora confermata in Parigi come si ha dalla Nota dell Sig. Bulard e da disegni presentati all'Accademia anzidetta. Il fenomeno della fase della cometa al tutto analogo a quella della luna e di venere venne pienamente confermato in Padova dal Sig. Professore Ronzoni nelle sere del 15, 16 e 17 di questo mese di Ottobre. Ecco quanto mi ebbe a comunicare, da me invitato, con sua lettera del 18 di questo mese: "La sera del 15 corrente essendomi posto ad osservare questi'astro mediante un eccellente rifrattore di Fraunhoffer della forza d'ingrandimento da 58 a 200 ne vidi il nucleo conformato a giusa di piccola *mezza luna* abbastanza bene determinata e di uno splendore giallicio non del tutto omogeneo, ma tale che la corda della mezza luna formava un brusco confine fra la parte splendente del nucleo, ed uno spazio pressochè uguale totalmente oscuro. Il più interessante poi si è che la detta corda era perpendicolare sensibilmente alla retta che va del centro del nucleo a quello del sole. Si notò eziandio che l'estensione della chioma dalla banda del

sole si era notevolmente accresciuta in confronto delle sere in ciu la cometa trovavasi più vicina al perielio.

Avendo io ripetuto le osservazioni nelle sere del 16 e del 17, i medesimi fenomeni mi si mostrarono ogui sera più cospicui. Parecchi astanti che osservarono anch'essi meco la cometa col medesimo telescopio in ciascuna delle tre sere, mi affermarono di vedere decisamente in tutto e per tutto ciò che vedeva io." Altri osservatori ebbero ad assicurare che il centro della coda presentava in prossimità del nucleo una specie di cono ombroso, e quindi una luce meno intensa nel mezza, che ai bordi della coda. Ora è naturale la dimanda della genesi della chioma e della coda, che presentono questi corpi cosi singolori e che destarono non di rado la meraviglia e lo spavento ancora degli uomini. Bessel e Struve nella celebre cometa di Halley, allorchè nel 1835 giunse al suo perielio osservarono delle irradiazioni e movimenti vorticosi di una visibile emanazione dal nucleo; ed ora Pape nella presente cometa afferma aver osservato ad Altona nelle sere 17, 20 e 21 di Settembre il nucleo dall'una porte ben terminato, dall'altra verso il sole diffuso per un arco di 120°, e come emanante una materia luminosa, che, dopo di aver costituito la chioma fluiva dietro del nucleo a formare la coda. Secundo queste osservazioni, sembra probabile la sentenza, che riconosce un passaggio della materia del nucleo allo stano elastico, ed una forza ripulsiva emanante dal sole che respinge in dietro detta materia in modo da formare la chioma e la coda, la quale si tenga unita più o meno al nucleo della cometa in virtù di una forza coercetiva, che lega le parti vaporose fra di loro e tutta la coda al nucleo. Mi gode l'animo nel leggere, che anche in Italia incominciano a diffondersi i paincipj della dinamica fisica molecolare; e che ora sia abbraciato quel dualismo, che da trenta e più anni ho sostenuto costantemente ne miei scritti.

Io aveva cercato fino dal 1842 di rendere sensibili le osservazioni di sopra riferite e le deduzioni intorno alla genesi e costituzione della chiama e coda delle comete, con una esperienza quanto semplice altrettanto parlante agli occhi del dotto e del minuto popolo ancora.

Nella sala di Fisica del R. Liceo di Venezia nel 1842 io disposi l'esperimento a questo modo. A mezzo di un portaluce universale introduceva nella sala resa oscura un fascetto di luce in direzione orizzontale, il quale andava a percuottere sopra un settore di una sfera cava di cristallo incoloro a pareti finissime. Questa era sostenuta pendula in oria da un sottile filo mettalico, e portava nel suo centro, mercè il prolungamento di detto filo, un nucleo solido opoco annerito alla superficie. La parte inferiore della sfera cristallina aveva

una larga apertura circolare. Veduta questa sfera illuminata dalla parte opposta al porta luce, appariva un globo trasparente con un nucleo falcato, che progettava un piccolo cono ombroso dietro di sè. Levato il nucleo opaco la sfera cristallina appariva un corpo trasparente, diafano in tutte le diregioni, nelle quali la si aveva ad osservare. Ecco, diceva a me stesso, un'imagine, un simbolo di una cometa con nucleo opaco e chioma; e senza nucleo ancora. Non contento di questo volli formi mi imagine ancora della coda. Presi del finissimo pluviscolo, come cenere, che teneva raccolto entro ad un pannolino di tessuto assai rado; e dal mio mecanico Sig. Francesco Cobres di cara ed onorata memoria, faceva scuotere il pannolino al di sotto della sfera e al di dietro della medesima nella direzione opposta a quella della luce. Io, che stava attentamente osservando, vedeva apparire il nucleo circondato da una specie di chioma, che si prolungava a forma di coda nella direzione opposta a quella del raggio luminoso. Dipendeva dalla mia volontà il prolungare più o meno la coda. Bastava ch'io estendessi di più o il pluviscolo. Poteva anzi per tal modo moltiplicare le code, cangiare la loro direzione; ed ancora generare degli anelli concentrici al nucleo. Tutto l'artificio consisteva nello spargere il pluviscolo a quel modo, che credeva più opportuno per far cambiare l'aspetto delle apparenze fenomenali. Io non ardisco di stabilire una identità fra miei esperimenti e gli effetti che presenta la natura nelle comete; ma è certo che artificialmente si ha mi imagine in una nostra camera oscura di quel maestoso fenomeno, che si ammira di notte sotto la volta celeste dell'universo non rischiarata, della luce del sole o della luna. Manca nell'esperienza descritta la virtù solvente, che si conosce nelle irradiazioni calorifiche solari; e forse anco nella materia stessa costituente la cometa.

Ma chiunque ha sperimentato sulla canfora, sul sodio e sul potassio come fece il Boutigny, collocati alla superficie di un'acqua stagnante si sara avveduto dei getti vaporosi formanti la coda di questi corpi, che in miniatura rappresentano gli effetti bizzarri, stravaganti ed irregolari al tutto analoghi a quelli delle comete. Più volte io ho richiamato nel corso delle mie lezioni l'attenzione degli uditori alle analogie che presentano le espansioni molecolari di questi corpi colle espansioni della materia nebulosa delle comete.

La questione della atmosfera de'pianeti è stata da lungo tempo agitata, e lo è ancora. Uno degli argomenti, che parve sempre il più concludente, si è la mancanza di sensibile rifrazione all'atto dell'occultazione di un corpo celeste.

Mala mancanza di rifrazione sensibile ci conduce necessariamente ad

ammettere la mancanza della esistenza d'un atmosfera? Mi parve sempre che la conclusione non fosse necessaria; perchè il potere rifrangente si lega a due condizioni: natura del mezzo rifrangente e densità del medesimo. Non potrebbe accadere che la materia formante l'atmosfera d'un pianetta avesse il minimo del potere rifrattivo da ruiscire insensibile ai nostri mezzi attuali? Il fenomeno della corona luminosa che presenta l'eclisse totale di sole mi parve l'argomento il più decisivo per comprovare l'esistenza della atmosfera della luna. Io che un tale effetto si riporta alla fotosfera solare; ma io non posso condurmi a tanta distanza col mio pensiero; ed in quella vece di troppo forse materializzando od impiccolendo i fenomeni della natura, ho cercato di creare, per cosi dire, questa corona luminosa. In luogo della sfera di cristallo collocai una sfera opoca annerita alla superficie. Percossa nella sua parte anteriore dal raggio solare, alla maniera stessa, che era stata la sfera di cristallo, io vidi guardando la parte posteriore o non illuminata dei fenomeni d'inflessione e d'interferenza luminosa, come una zona rossa che divideva l'emisfero illuminato dall'emisfero non illuminato; e degli accidenti di luce nello emisfero non illuminato, che non saprei ben descrivere; ma che però erano analoghi a quelli che presentò al mio sguardo il disco lunare progettato sopra il disco solare nel 1842. Non tutti convennero nell' eclisse del 1842 in questa mia osservazione; ma vi convennero tutti quelli che erano dotati di una virtù visiva la più penetrante e precipuamente gli artisti, che hanno l'occhio addestrato in tutti gli accidenti della luce. Non vidi in questo mio esperimento la corona luminosa, che avesse circondato il globo pendulo in aria; ma creai tosto questo corona sollevando al disotto del globo una atmosfera di pluviscolo o di materia attenuatissima. Collocato io nel cono ombroso vidi sempre questa corona nel modo il più distinto. Per tal guisa, io diceva a me stesso, si rende visibile l'esistenza d'un atmosfera circondante la luna e in generale i pianetti. Non si può ammettere (nello stato attuale della scienza), corpo al tutto fisso. Ciascuno ha la sua atmosfera, che è la causa di tanti fenomeni di azione reciproca, che prima delle dottrine della Dinamica molecolare, sembravano al tutto enigmatici e misteriosi.

Non mi fu mai di nessuna difficoltà l'ammettere riflessione di luce senza sensibile rifrazione della medesima. Avvegnachè l'un fenomeno non si leghi alle stesse identiche condizioni dell'altro. Nelle comuni esperienze, che si fanno per rendere visibile l'andamento o il cammino che segue il raggio luminoso in una camera oscura, non ho mai veduto che abbia luogo deviazione sensibile del raggio incidente sopra

di un piano per il pluviscolo o polverio che artificialmente s'innalza. Ed allora la riflessione rende visibile la luce in tutte le direzioni. Dirò di più la luce diretta, che non presenta sensibile polarizzazione, appare egregiamente polarizzata in tutte le sue parti, che sono specularmente riflesse dal pluviscolo nuotante nell'aria. Col polariscopio a bande di Savart tenuto col piano di polarizzazione verticale appare il fascio luminoso trasversalmente intersecato dalle note fascie collorate. Anche questo esperimento concorre a rendere sempre più stretta l'analogia fra la genesi supposta dei fenomeni delle comete, e quelli che artificialmente noi produciamo né nostri Gabinetti. Porrô fine a questo mio scritto con una osservazione che è stata fatta da parecchi in Padova ed ancora in Francia come ho dalla Lumière. Arturo all'atto della sua immersione perdette lo suntillamento, e lo riacquistò all'atto dell' emersione. Le altre stelle coperte dal velo trasparente della coda della cometa apparvero a diligenti osservatori come tanti punti luminosi che abbellivano la coda; non altrimenti che in alcuni antrichi dipinti si scorge, nè quali attraverso un finissimo velo appajano què punti luminosi che l'arte seppe rappresentare e che non ugualmente lo può la parola anche degna interprete dei fenomeni della natura. Questo fatto dimostra che lo scintallamento è un fenomeno cosmico ultratmosferico, che ci guida a nuove meditazioni intorno alla natura degli spazii celesti.

The following donations were announced:—

FOR THE LIBRARY.

Journal of the Franklin Institute. Philadelphia, Nov. 1858. 8vo.

Albany Astronomical Journal. No. 118.—*From B. A. Gould.*

American Journal. New Haven, Nov. 1858.—*From the Editors.*

Letter of W. Re Kyan Bey to Edwin De Leon, on the Treatment and Use of the Dromedary. Washington, 1858. (35 pages.) 8vo.—*From Major Wayne, U. S. A.*

Report of the Dinner given to Prof. Morse, in Paris, Aug. 17, 1858. Paris, 1858. (70 pages.) 12mo.—*From S. F. B. Morse.*

Remarks on the recent Travels of Dr. Barth, read before the New York Ethnol. Soc. by W. B. Hodgson. Nov. 1858. (18 pages.) 8vo.

Memoir of John Q. Adams, by Jos. Quincy. Boston, 1858. (428 pages.) 8vo.—*From the Author.*

Mittheilungen der K. K. Geograph. Gesell. 11 J. 1858, h. 1. Wien, 1858. Great 8vo.—*From the Society.*

Ten pamphlets on various electrical and physical subjects, by Prof. Zantedeschi; from various European publications.—*From the Author.*

Dr. Dunglison, pursuant to appointment, read an obituary notice of the late Dr. John K. Mitchell, a member of the Society.

Dr. John Kearsley Mitchell was born in Shepherdstown, Virginia, on the 12th of May, 1793. His father was Dr. Alexander Mitchell, a native of Scotland, and a member of a respectable family in Ayrshire, who came to this country in 1789, took up his residence in Jefferson County, Virginia, and soon afterwards married into the Kearsley family, who resided at that time in Pennsylvania. Dr. Mitchell's father died before he was nine years old; and he was left in charge of a guardian, who sent him to Scotland in 1807, to be educated. In the town of Ayr he received his early instruction, and it was here, in the land of Burns, that he imbibed that love for the simple, but eminently expressive productions of Scotia's bard, which led him, on many occasions, whilst, as he remarked, "he sat in his office and waited for practice," to indulge in poetical compositions, several of which were received with no little favour. From Ayr he went to the University of Edinburgh, to complete his scholastic education, and in the year 1816 returned to America, and commenced the study of his profession with Dr. Kramer, of Jefferson County, Virginia, for whom he ever felt the greatest respect and veneration, and of whose character he often spoke enthusiastically in his lectures before the class of Jefferson Medical College. Subsequently, he became a pupil of Professor Chapman, of Philadelphia. His studies were, however, interrupted by impaired health, which induced him to take a voyage to China, from which he returned much improved; and after having obtained his diploma in the University of Pennsylvania, in 1819, he twice repeated the voyage in the capacity of surgeon to a merchant vessel. On his return to America, he established himself in Philadelphia, and, early in 1822, married a daughter of Alexander Henry, Esq. In the same year he was appointed physician to the Almshouse Hospital, and, some years afterwards, to the Pennsylvania Hospital. Between the years 1833 and 1838, he delivered a course of lectures on chemistry applied to the arts, in the Franklin Institute, and as early as the year 1822, formed part—as lecturer on medical chemistry—of the first summer association for teaching medicine, established in Philadelphia. He lectured, also, on

physiology and on chemistry, for some years, to a private class. In the year 1841, on the reorganization of the Faculty of Jefferson Medical College, he was looked to as eminently qualified to occupy the Chair of Practice of Medicine, to which he was accordingly appointed, and from that time forward ably fulfilled the various duties which appertained to it. In the spring of 1856, he was attacked with hemiplegia, from which he gradually, but never wholly recovered. It did not, however, interfere with the active exercise of his professorial duties in the following winter. In the course of the subsequent session, he experienced a second but slighter attack, which did not prevent him from meeting his class for more than a week, and neither of them seemed to have impaired his intellect. He never, indeed, rendered the various services that devolved upon him as professor, with greater satisfaction to his hearers. In the latter end of March, 1858, he was attacked with typhoid pneumonia, which speedily terminated his existence, in the 65th year of his age.

In the various relations of life, Dr. Mitchell was highly and justly estimated. In his profession he was held in great regard. Kind and attentive to his numerous patients, he was looked upon as a valued friend, as well as cherished medical adviser; as a teacher of medicine, he was faithful and energetic, alive to every improvement, and ever anxious to imbue his pupils with the great principles of their profession, and with the divine art of applying these principles to practice; as a cultivator of general science, he was full of zeal; and whilst he was a lecturer on chemistry—and there are many who retain a vivid recollection of his merits as such—he was watchful for every suggestion of value, and hastened to adopt them, with modifications indicated by his own ingenious and fertile mind. An example of this was the apparatus framed by him for the formation of solid carbonic acid. His researches, too, into the phenomena of capillarity, as exhibited in the penetrativeness of different liquids and gases, and the penetrability of different septa, and respecting which a philosopher of great distinction, Milne Edwards, of Paris, has very recently expressed his astonishment that they should have been treated with neglect by the greater part of physicists, were replete with interesting applications to physiology more especially. As a member of society he was most estimable; in his own family the beloved centre of the domestic circle; as a colleague in the college to which he was attached, and in the various charitable and other associations to which he belonged, courteous and gallant, and as a friend, firm and unwavering in his attachments.

As an author, he confined himself chiefly to Monographs, several of which were published in the scientific journals, and in detached pamphlets. To one on the penetration of gases, allusion has already been made. Others were on the Formation of Solid Carbonic Acid Gas; on Air, Fire and Water, as illustrating the Wisdom and Goodness of God; a new Theory and Treatment of Rheumatism; on Curvatures of the Spine; on the Tests for the Detection of Arsenic; on the Smallpox; on the Means of elevating the Character of the Working Classes; on the Value of the Practical Interrogation of Nature; on the Value of a great Medical Reputation, &c. &c.

Several of these were originally delivered before the Franklin Institute or the Jefferson Medical College. He read, also, before the College of Physicians of Philadelphia, an interesting communication on the phenomena of mesmerism as observed by him, with the inferences which he drew therefrom. His most elaborate monograph, however, was on the cryptogamous origin of malarial fever, which was replete with interesting facts and ingenious deductions. He published, also, an article in the American Cyclopedia of Medicine and Surgery, on the Chemical and Pharmaceutical History and Toxicological Effects of Arsenic, and edited the American reprint of Faraday's Chemical Manipulations.

Dr. Mitchell was the author of various other scientific and literary productions, which added to his well earned and well merited reputation; and was a member of many scientific, literary, and philanthropic institutions.

He was elected into this Society in the year 1827.

The meeting then proceeded to the consideration of the resolution offered at the last meeting, proposing to repeal that clause of Sect. 3, Chap. II. of the Laws of the Society, which prohibits the election of any person as President, at more than two out of any three successive elections:—

And a vote being taken upon the proposed amendment, it was agreed to, the yeas being 23, and the nays 2: so the amendment was adopted, and the clause stricken out as proposed.

Stated Meeting, December 3, 1858.

Present, thirteen members.

Dr. Franklin Bache in the Chair, the Vice-Presidents being absent.

Letters were read:—

From the Bath and West of England Society, dated December 1857, acknowledging the receipt of Proceedings of this Society, Nos. 55 and 56, and of Part 1, Vol. XI. of the Transactions,—and also announcing a donation for the library:—

From the Royal Saxon Society of Sciences, dated Leipzig, Jan. 6, 1858, returning thanks for No. 56 of the Proceedings, and Part 1, Vol. XI. of the Transactions:—

From the Royal Society of Sciences at Upsal, dated Jan. 8, 1858, returning acknowledgements for Part 1, Vol. XI. of the Transactions, and No. 56 of the Proceedings of this Society:—

From the Librarian of the Royal Library at Berlin, dated Jan. 18, 1858, acknowledging the receipt of Part 1, Vol. XI. of the Transactions:—

From the Royal Society of Sciences at Göttingen, dated May 26, 1858, announcing the receipt of Part 1, Vol. XI. of the Transactions, and Nos. 55 and 56 of the Proceedings of this Society:—

From the Central Physical Observatory at St. Petersbourg, dated June 1, 1858, returning thanks for Part 1, Vol. XI. of the Transactions, and No. 56 of the Proceedings:—

From the Royal Academy of Sciences at Turin, dated May 15, 1858, returning thanks for Part 1, Vol. XI. of the Transactions:—and

Frof. Zantedeschi, of Padua, dated Oct. 7, 1858, announcing the transmission, through the U. S. Consul at Bremen and the Department of State at Washington, of a number of treatises by him on subjects of physical science.

The following donations were announced:—

FOR THE LIBRARY.

Proceedings Boston S. N. H. VI. 25. Oct. 1858.

Radcliff Obs. XVII. Oxford, 1858.—*From the Trustees of Obs.*

Ordnance Trigonometical Survey of Great Britain and Ireland, account of the observations and calculations of the Principal Triangulation, &c. London, 1858. (782 pages with a volume of plates.) 4to.—*From Sec. of State for War.*

Transactions Soc. Antiq. 3. II. (Pages 315 to 498 with index, last paper read Feb. 18, 1858.) London, 1858. 4to.

Proceedings of the same. IV. 47. (Pages 50 to 115, to meeting June 18, 1857.) London, 1858. 8vo.

List of the same, April 23, 1858.—*From the Society.*

British Association, Report of 27th Meeting. Dublin, Sept. 1857. London, 1858. 8vo.—*From the Association.*

Proceedings Roy. Geograph. Soc. II. 3, 4, 5, (to July, 1858) and address of Sir R. J. Murchison, May 24. London, 1858. 8vo.

Journal Soc. Arts, May 7, to Sept. 24. London, 1858. 8vo.

Proceedings Roy. Soc. IX. 30, 31, to June 10, 1858. 8vo.

Philosoph. Trans. of the same. CXLVII. III. London, 1858. 4to.

Greenwich Obs. in 1856. London, 1858. 8vo.—*From the Roy. Soc.*

Archives du Museum. X. 1, 2. Paris, 1858. 4to.

Compte rendu de l'Acad. St. Petersbourg for 1856. St. Pet. 1857. 8vo.

Nachrichten von der Georgs Augusts Universität und König. Gesell. zu Göttingen, vom J. 1857, 1 to 23 nebst Register, 1858 12mo.

Abhandlungen der K. Gesell, zu Göttingen VII. Göttingen, 1857. 4to.

Memorie della R. Acad. di Torino. 2. S. XVII. Turin, 1858. 4to.

Annals of New York Lycæum N. H. VI. 8, 9. New York, 1858. 8vo.

Med. News. XVI. 192. Phila. 1858. 8vo.—*From Blanchard & Lea.*

Mr. Fraley announced the decease of Lieut. Col. William Reid, late Governor of Bermuda, a member of the Society.

The Annual Reports of the Treasurer and the Committee of Publication were presented and read;—the Treasurer's Report being, as usual, referred to the Committee of Finance.

Judge King, from the Committee on the legacy bequeathed to this Society by the late François André Michaux, made a statement, on the part of the Committee, relative to a correspondence which has been recently had with certain parties in France, on the subject of a transfer of Stock in the French funds to the Society by Madame Michaux, to the amount of the legacy,—the interest to be received by her during her life, according to the will of Mons. Michaux:—and, in relation to this subject, offered the following resolution:—

Resolved, That the Officers and Council of the Society are hereby authorized to demand and receive, on behalf of the same, from the executors of the last will and testament of François André Michaux, deceased, or whoever may have the legal charge and custody thereof, the sum of money bequeathed by the said François André Michaux to the Society in trust for the purposes expressed in the said legacy; and, if necessary, to appoint an attorney or attorneys under them for the purpose of demanding, receiving and seeing to the proper investment or transfer of the same;—which resolution was read, considered and adopted.

A report was made by the librarian, on leave given, in relation to the preparation of a catalogue of the library, and stating the plan and progress made in the same;—which was read and ordered to be inserted on the minutes.

A committee of six members was appointed to suggest the names of Officers of the Society for the ensuing year,—to make report at the next stated meeting.

Stated Meeting, December 17, 1858.

Present, thirty-nine members.

Mr. LEA, Vice-President in the Chair.

Dr. Edward Hartshorne, a recently elected member, was introduced and took his seat.

A letter was read from M. Jomard, dated Paris, Nov., 1857, returning thanks for Part 1, Vol. XI. of the Transactions of the Society.

The following donations were announced:—

FOR THE LIBRARY.

Annual Report of the Commissioner of Statistics to the General Assembly of Ohio for 1857. Columbus, 1858. (112 pages.) 8vo.
—*From E. D. Mansfield, Com.*

Quarterly Summary Trans. Coll. Phys. III. 5. Phila. 1858. 8vo.

Journal of the Franklin Inst. No. 6. Phila. Dec. 1858. 8vo.

Catalogue of Coleoptera of the regions adjacent to the boundary line between U. S. and Mexico, by John L. Le Conte, M.D. Philada. 1858. (33 pages with plates.)—*From the Author.*

Proceedings New Jersey Hist. Soc. VIII. 3. New York, 1858. 8vo.

On Picric Acid, &c. by M. Carey Lea. Phila. 1858. (7 pages.) 8vo.

Embryonic forms of thirty-eight species of Unionidæ, by Isaac Lea. Phila. 1858. (7 pages.) 4to.—*From the Author.*

Smithsonian Contributions. Ancient fauna of Nebraska, by Joseph Leidy. Memoir on the extinct Sloth tribe of America, by the same. Washington, 1858. (200 pages with plates.) 4to.

The report of the Committee of Finance was read, and the appropriations therein recommended for the ensuing year were ordered to be made, viz:

For Journals, . . .	$50
„ Hall, . . .	250
„ Binding, . . .	50
„ Publications, . .	400
„ General Account, .	1500
Total,	$2250

The committee appointed at last meeting to suggest the names of officers to be voted for at the annual election of the Society in January next, made a report, which was ordered to be printed and furnished to each resident member.

Dr. R. E. Rogers made an oral communication in relation to the condition of water when apparently in contact with highly heated surfaces; but which is, in reality, as though suspended in spheroids above the heated mass;—and described some experiments which led him to infer that the peculiar phenomena observed are due to a repulsion existing between the heated matter and the water.

Prof. Kendall presented a communication from Lieut. Col. J. D. Graham, entitled "Contributions to Geography," which was referred to the reporter for publication in the Proceedings of the Society.

CONTRIBUTIONS TO GEOGRAPHY, No. I.

On the Latitude and Longitude of Chicago, Illinois. By Lieut. Colonel J. D. Graham, of the U. S. Corps of Topographical Engineers.

Chicago, Illinois, November 29th, 1858.

To the American Philosophical Society, Philadelphia.

In my letter of the 2d of April last, published at pp. 313 to 315 in Vol. 6 (No. 59) of the proceedings of the Am. Phil. Society, I stated that I was induced, in the month of January previous, to make a few observations with my sextant of 7¼ inches radius, artificial horizon of quicksilver, and chronometer, for the approximate determination of the latitude of the City Hall, or Court House of Chicago. The approximate result announced for the latitude of that point, was 41° 53′ 09″.7 N.

It was derived from two nights' observations, rather hastily made, consisting in all of 19 observed double altitudes of Polaris (α Ursæ Minoris), north, and 13 observed double (circum-meridian) altitudes of β Orionis, south.

Desiring to obtain a closer approximation to the true latitude of the point in question, and having no other instruments at my command than those already described, I made, with them, on the nights of the 15th and 23d of August, and the 18th of September of the present year, the observations given below.

The stars observed on were arranged in pairs, and were selected so that one of each pair should pass the meridian to the north and the other to the south of the zenith, and at nearly equal meridian altitudes. This was done for the purpose of eliminating any small and imperceptible errors that might appertain to the sextant, either in the graduation of the limb, or circular arc—in the centering of the same—in the adjustment of the mirrors—in the collimation of the telescope, or in the refraction as affected by any peculiar state of the atmosphere, especially in cases where neither thermometer nor barometer is at hand to aid in this last correction;—and also for the purpose of eliminating any error of personal equation appertaining to the observer. The index error, as it is called, of a sextant or other reflecting instrument, can only be approximately ascertained. Any residual error in its measurement is also eliminated by the arrangement above mentioned.

The *time* stars were also selected in pairs and of very nearly the same declination—both of north declination in this latitude—and of such right ascensions that one could be observed when near the east

and the other when near the west prime vertical, with but little elapsed time between the periods of their being at nearly equal altitudes when in these respective positions.

When, owing to peculiar circumstances, these time stars could not be observed when in the prime vertical, care was taken to observe them both on the same side of it, either both when north or both when south of that plane.

This was done to secure the same eliminations of errors as are above described, and also for the elimination of the effect of any small error in the observed latitude, when it was to be used as a term in the equation for computing the time.

In some instances equal altitudes of the same star were observed east and west, or before and after passing the meridian, for computing the time. This method ensures a perfect elimination of all the errors above described in obtaining the time, provided the temperature remains nearly the same during the elapsed time between the east and west observations. If, however, there be much change of temperature between these two periods, the effect upon the angular positions of the mirrors, with respect to the plane of the circular arc, may be such as to produce an appreciable error in the times of the western observations. One-half of this error would enter into the result for the time, by chronometer, of the meridian passage of the star. There is another inconvenience which sometimes attends this method of getting the time, which is, that after the observations are made east, clouds may arise before the time arrives for making those west, and thus cut them off. There is usually an elapsed time of five or six hours within which such an impediment may occur, unless the weather be settled.

It is only, therefore, when the temperature of the outward air is pretty uniform, and the weather clear and settled, that we have resorted to this method.

With these precautions a practical observer may, even with so light and portable an apparatus as a sextant of good construction, reading to ten seconds of arc by aid of the vernier, an artificial horizon of quicksilver, and a good watch or chronometer, obtain a pretty close determination of the local time, and of the latitude of a place, by a few hours' work in a single night.

The station occupied for the observations here reported, was the side walk on the north margin of Huron street, eighty (80) feet east of the middle of Wolcott street. It is also four hundred and three (403) feet south of the parallel, and two hundred and nine (209) feet west of the meridian of the observing station No. 1, near the Roman

Catholic Church, which was occupied in May, 1857, for determining the difference of longitude between this place and Quebec; for an account of which see pp. 12 to 21, and 56 to 60, of Senate (Executive) Documents No. 42, of the 35th Congress, 1st Session.

By triangulation, based, for orientation, on the true meridian line determined with the astronomical transit in May, 1857, we find that our present station, which I call Chicago observing station No. 3, is 4,059.49 feet north of the parallel, and 1,027.16 feet east of the meridian of the centre of the dome of the City Hall or Court House of Chicago, equal to 40″.11 difference in latitude, and 13″.6 of arc=0.9 of a second of time, difference in longitude.*

Observations for the Latitude of Chicago.

1*st.* 1858, *August* 15*th.* *Station No.* 3.

Time stars α Andromedæ east, and α Coronæ Borealis west. Also, equal altitudes of α Cygni.

LATITUDE OF STATION:

By 25 circum-meridian altitudes of α Aquilæ (Altair) S., combined with 17 circum-meridian altitudes of γ Cephei, N. - - - - - - - 41° 53′ 46″.8

2*d.*—*Same Night.*

LATITUDE OF STATION.

By 12 circum-meridian altitudes of α Aquarii, S. combined with 10 altitudes of Polaris, (α Ursæ Minoris) N., - - - - - - - - 41° 53′ 45″.6

3*d.* 1858, *August* 23*d.*

Time stars the same as on the 15th.

LATITUDE OF STATION:

By 24 circum-meridian altitudes of α Aquilæ, S., combined with 18 circum-meridian altitudes of γ Cephei, N., - - - - - - - 41° 53′ 47″.3

NOTE. There was still another observing station, called Chicago observing station No. 2. As I shall have occasion hereafter to refer to its position in longitude for chronometric comparisons with other places, I may as well here mention that it is 24 feet=0″.24 north of the parallel, and 179 feet=2″.37 of arc, or 0.16 of a second of time west of the meridian of the 1st. observing station, or that of May, 1857.

4th. 1858, *September* 18*th.*

Time stars, α Andromedæ, east, and α Coronæ Borealis, west. Also, equal altitudes of α Pegasi.

LATITUDE OF STATION:

By 15 circum-meridian altitudes of α Aquilæ, south, combined with 26 circum-meridian altitudes of γ Cephei, north, - - - - - - -	41° 53′ 46″

5th.—Same Night.

By 28 circum-meridiam altitudes of α Aquarii, and 22 circum-meridian altitudes of β Aquarii, both south, and a mean from which was taken as one quantity, combined with 18 altitudes of Polaris (α Ursæ Minoris), - - - - - - - - -	41° 53′ 45″.8
Mean;—or latitude of station No. 3, by giving the observations on each pair of stars an equal weight,	41° 53′ 46″.3
Reduction to the centre of the dome of the City Hall, or Court House of Chicago, - - -	— 40″.1
Latitude of the dome of the City Hall, or Court House of Chicago, from this series, - - -	41° 53′ 06″.2
Extreme difference in the 5 results - - -	1″.7

The result of this series gives the latitude 3″.5 less than was reported in my letter of the 2d of April last. As they were hastily made to answer a call upon me by some of the citizens of Chicago to know the approximate latitude of the place, I do not propose to give them a weight here, but I would offer the result from the five sets of observations made in August and September as a close approximation.

I would adhere to the longitude of this position as given in my letter of April 2d, namely: $5^h.\ 50^m.\ 32^s.08 = 87°\ 38'\ 01''.2$ west of the meridian of Greenwich.

From these determinations, and our connections by triangulation, we obtain the positions of other stations in the city of Chicago, and as I am obliged, from peculiar circumstances, to use sometimes one and sometimes another, for the purpose of making chronometric comparisons, in order to determine the longitudes of other important places in the west, I beg leave to present them here in a tabulated form for future convenient reference. They are:—

POSITIONS IN THE CITY OF CHICAGO.	Latitude North.	Longitude West of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1st. Station No. 1, the observing station of May, 1857, - - - -	41 53 50.3	87 37 44.8	5 50 30.99
2d. Station No. 2, in the yard of the University of Saint Mary of the Lake, - - - - - - - -	41 53 50.5	87 37 47.2	5 50 31.15
3d. Chicago observing station No. 3, on the north side-walk of Huron Street, 80 feet east of the middle of Wolcott Street, - -	41 53 46.3	87 37 47.5	5 50 31.2
4th. Steeple (front door) of the Roman Catholic Church of the Holy Name, on Wolcott Street, between Huron and Superior Streets, - - - - - - - - -	41 53 48	87 37 47.7	5 50 31.18
5th. Steeple (front door) of the Episcopal Church of St. James, on Cass Street, at the S. E. corner of Huron Street, - - - -	41 53 45.2	87 37 43	5 50 30.87
6th. Dome of the Chicago City Hall, or Court House, - - - - - -	41 53 06.2	87 38 01.2	5 50 32.08
7th. The New Iron Light House, (unfinished) at the end of the North harbour-pier, - - - -	41 53 24.9	87 36 59	5 50 27.93
8th. Steeple of the West Market House, at the intersection of the middle of Randolph Street with the west margin of Des Plaines Street, - - - - - - - - -	41 53 08.4	87 38 47.8	5 50 35.19
9th. The point where stood the Flagstaff of Fort Dearborn, now destroyed to cut off a bend in Chicago River, - - - - - - -	41 53 22.9	87 37 35.6	5 50 30.37
10th. Intersection of the middle of North Clark Street, with the middle of Michigan Street; north division of the City, - - - -	41 53 28.5	87 37 59.1	5 50 31.94
11th. Tall chimney of the Illinois Central Rail Road Company's Machine Shop, on the lake shore, between Twelfth and Fenimore Streets; south division of the City, - - - - - - - - -	41 51 50.5	87 37 21.27	5 50 29.42
12th. The old Light House, on the south bank of the Chicago river, near River Street, - - - - -	41 53 22.5	87 37 38.77	5 50 30.59

The foregoing table affords great convenience in enabling me to take the Chicago time, by observation, at the station nearest to the rail road depot, from whence I have to start to go to any distant place which I may wish to connect chronometrically in longitude with the

meridian of Chicago, which I consider well determined with reference to the meridian of Greenwich.

I have already thus connected nine important points between Erie, Pennsylvania, and Prairie du Chien on the Mississippi river, and determined approximately their latitudes; but I have not time, at this moment, to add them here. I will, however, offer them at a future time, and as soon as I can arrange them in a brief form. They go to show that portions of the upper Mississippi river are laid down, even on the latest and most approved maps, several miles out of place in longitude.

I wish to offer this paper, as it is, for publication in the Society's Proceedings, provided it be considered acceptable.

J. D. GRAHAM,
Member of the Society.

CONTRIBUTIONS TO GEOGRAPHY, No. 2.

On the Latitude and Longitude of four additional positions on Lake Michigan, and of* MADISON, *the Capital of the State of Wisconsin; from astronomical observations by Lieut. Colonel J. D. Graham, U. S. Corps of Topographical Engineers.

Chicago, Illinois, December 14th, 1858.

To the American Philosophical Society, Philadelphia.

In my letter of the 29th ultimo, I offered for the consideration of the Society, and for publication in its Proceedings, some observations on the latitude and longitude of Chicago.

I beg leave now to offer, for the same, the following observations in a brief form, made between the 20th of June and the 7th of September, 1858, for the determination of the geographical positions of the following places. Calling Chicago I, as already presented, I will enumerate the others, for convenient reference, as follows, viz:—

II. MICHIGAN CITY, INDIANA.
III. WAUKEGAN, ILLINOIS.
IV. RACINE, WISCONSIN.
V. MILWAUKEE, WISCONSIN.
VI. MADISON, THE CAPITAL OF WISCONSIN.

The instruments used for the observations were all of a portable character, adapted to ready use at night, whenever I had occasion to halt in the course of a long journey by rail road.

I will describe them as follows, viz:—

1. A sextant of 7¼ inches radius, made by Simms, of London, reading by aid of the vernier to 10 seconds of arc.
2. An artificial horizon of quicksilver.
3. A sidereal chronometer No. 2557, by Parkinson and Frodsham, of London; beats half-seconds.
4. A mean solar chronometer No. 141, by Isaiah Lukens, of Philadelphia; beats half-seconds. This chronometer runs eight days without winding. It was made by Mr. Lukens about the year 1830 or 1831, while on a visit to London. It is one of the earliest chronometers, I know of, made by an American. It is now an excellent time-keeper.

The latitudes, as will be seen, are derived from observed circum-meridian altitudes of stars arranged in pairs, one of each pair passing the meridian to the north and the other to the south of the zenith. When it could be done, they were selected of such declinations as to cause them to pass the meridian at altitudes varying only a few degrees, say 2° to 3°. But this last mentioned advantage for a close elimination of errors could not always be secured on the occasions here presented. There is, however, an approximate elimination from having one of the stars of each pair to pass the meridian to the north and the other to the south of the zenith.

The time stars were selected also in pairs, the one being observed eastward and the other westward of the meridian, and conformable, as nearly as was practicable under the circumstances attending each case, to the principle stated in my communication of the 29th ultimo.

The longitudes are all derived from chronometrical comparisons with the meridian of Chicago. They rest, for accuracy, on the correctness of my determination, in the year 1842, of the longitude of the citadel of Quebec, west of Greenwich, already alluded to in my previous communications, and on the sextant observations for the time at Chicago and at the several places whose longitudes are sought.

All the comparisons of time with the meridian of Chicago,—now assumed as a primary for my operations in our western country,—were by means of electric signals transmitted forth and back along the telegraphic wires.

The system adopted was as follows:—The night before visiting a place whose geographical position was to be ascertained, observations were made for the time at Chicago, with the sextant, the artificial horizon of quicksilver, and the sidereal chronometer. Both before

and after these observations the sidereal and mean solar chronometers were compared. This gave the error of the first on sidereal, and of the second on mean solar time for the meridian of the Chicago observing station. Immediately on returning to Chicago the same thing was again done. This gave a new determination of the errors for the second Chicago period, and also the rates of both chronometers during the elapsed time.

Between these two periods the journey forth and back was made, and also the observations at the place whose position was sought, and the telegraphic signals exchanged, in the manner hereinafter reported.

The mean solar chronometer was always left at Chicago, and the signals sent from that place, as well as those sent to Chicago, were noted by it there.

The observations at the distant station, whose position was sought, and the telegraphic signals received at and sent from that station, were all noted there by the sidereal chronometer. These signals were always made by myself by pressing the telegraph key with the fingers, so as to produce the click of that key as nearly as possible in coincidence with a given beat of the chronometer.

The signals at Chicago were always made by an experienced telegraph operator, who was, in the beginning, carried through a course of practice in making dots as nearly as possible in coincidence with the beats of the mean solar chronometer at every ten seconds of interval, for seven to ten and sometimes thirteen minutes as a series. It is remarkable how soon a person, with a good ear for cadence, or time, will acquire an accuracy in making these time-signals approaching almost to exactness. The results which will presently be presented will serve as evidence on this point.

After the observations for the time, at the place visited, were completed, the sidereal chronometer was carried to the telegraph office at that place. I then began by calling for a certain number of signals from Chicago at intervals of ten seconds apart, sufficient to insure two or three periods of coincidence in the beats of the two chronometers.

This period of coincidence of beats having been thus ascertained, signals were sent from the distant station back to Chicago, at intervals that would ensure a coincidence with the beats of both chronometers. These intervals were easily ascertained by making allowance for the difference of the rates of the two chronometers affected by their proper algebraic signs of + when gaining, and — when losing, as well as for the gain of sidereal on mean solar time.

Sometimes additional signals were called for from Chicago at stated

moments, varying the interval two, three, or four seconds, each way, and sometimes throwing them into the half-second beats, and at others into the whole-second beats at that place, as tests upon the series. The reductions from Chicago mean solar to sidereal time, with the difference of the rates of the two chronometers incorporated into the calculations, give the fractions of a second which appear in the stated differences of longitude between the two stations—the signals corresponding to coincident beats of the two chronometers being the only ones used in the computations.

I will now proceed to state, in a brief form, the observations and the results derived from them.

The Observations for Time at Chicago.

1*st.* 1858, *June* 20*th. At Chicago Observing Station No.* 2, *in latitude* 41° 53′ 50″.5 *N.: longitude* 5*h.* 50*m.* 31*s*.15 *W.*

Sidereal chronometer No. 2557, fast:	*m.*	*s.*
By 11 observations on α Lyræ, east (at 15*h.* 40*m.* sidereal)	59	18.93
By 12 observations on α Bootis, west (at 16*h.* 13*m.* sidereal)	59	18.32
Result—Chronometer No. 2557, fast of sidereal time for this station (at 15*h.* 56*m.* sidereal)	+ 59	18.62
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 10*h.* 00*m.* mean time)	— 4	59.07

2*d. June* 22*d. Same Station.*

Sidereal chronometer No. 2557, fast:	*m.*	*s.*
By 14 observations on α Lyræ, E. (at 15*h.* 36*m.*)	59	30.90
By 16 observations on α Bootis, W. (at 16*h.* 10*m.*)	59	30.53
Result—Chronometer No. 2557, fast of sidereal time for this station (at 15*h.* 53*m.*)	+ 59	30.71
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 9*h.* 48*m.* mean time)	— 4	58.33

3d, 1858, *June 28th. Same Station.*

	h.	m.	s.
Sidereal chronometer No. 2557, fast:			
By 10 observations on α Lyræ, E. (at 15*h*. 37*m*.)	1	00	07.92
By 12 observations on α Bootis, W. (at 16*h*. 08*m*.)	1	00	07.20
Result—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 52*m*.) - -	+ 1	00	07.56
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 9*h*. 25*m*.) -	— 4	53.75	

4th. June 30th. At Chicago Observing Station No. 3, in latitude 41° 53′ 46″.3 N., longitude 5h. 50m. 31s.2. W.

	h.	m.	s.
Sidereal chronometer No. 2557, fast:			
By 10 observations on α Coronæ Borealis, W. (at 19*h*. 22*m*.) - - - - -	1	00	21.22
By 13 observations on α Andromedæ, E. (at 20*h*. 08*m*.) - - - - -	1	00	20.48
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h*. 45*m*.) - -	+ 1	00	20.85
By comparison—Chronometer No. 141, slow of mean solar time for this station, (at 13*h*. 09*m*. mean time)	— 4	53.1	

5th. 1858, *July 3d. At Chicago Observing Station No. 2.*

	h.	m.	s.
Sidereal chronometer No. 2557, fast:			
By 6 observations on α Lyræ, E. (at 16*h*. 12*m*.) - - -	1	00	36.95
By 12 observations on α Cygni, also east (at 17*h*. 13*m*.) - -	1	00	37.40
By a mean of the results from two East stars (at 16*h*. 42*m*.) - - - -	1	00	37.17
By 14 observations on α Bootis, W. (at 16*h*. 38*m*.)	1	00	37.03
Result—Chronometer No. 2557, fast of sidereal time for this station (at 16*h*. 40*m*.) - -	+ 1	00	37.1
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 9*h*. 53*m*. mean time)	— 4	50.53	

6th. July 5th. At Chicago Observing Station No. 3.

Sidereal chronometer No. 2557, fast:		
By 14 observations on α Coronæ Borealis, W. (at 19*h*. 28*m*.) - - - - -		*h*. *m*. *s*. 1 00 50.08
By 18 observations on α Andromedæ, E. (at 20*h*. 00*m*.)		1 00 49.97
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h*. 44*m*.) - -		+ 1 00 50.02
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 12*h*. 48*m*. mean time)		— 4 49.38

7th. 1858, *July 7th. At Chicago Observing Station No. 2.*

Sidereal chronometer No. 2557, fast:			
By 5 observations on α Lyræ, E. (at 15*h*. 27*m*.) using horizon roof No. 1, being an old one in use 18 years, -	*h*. *m*. *s*. 1 01 00.06		
By 8 observations on α Bootis, W. (at 16*h*. 17*m*.) with same roof, -	1 00 59.34		
By E. and W. stars (at 15*h*. 52*m*.) using horizon roof No. 1,	+ 1 00 59.7	*h*. *m*. *s*.	
		+ 1 00 59.70	
By 5 observations on α Lyræ, E. (at 15*h*. 36*m*.) using horizon roof No. 2, a new one, - - -	1 00 59.91		
By 7 observations on α Bootis, W. (at 16*h*. 02*m*.) also using roof No. 2,	1 00 59.41		
By the same E. and W. stars (at 15*h*. 49*m*.), using horizon roof No. 2,	+ 1 00 59.66		
		+ 1 00 59.66	
Result—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 50*m*.) by 10 observations on α Lyræ, E.; 15 observations on α Bootis, W.		+ 1 00 59.68	
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 8*h*. 48*m*. mean time)		— 4 48.79	

8th. 1858, *July* 12*th.* *At Chicago Observing Station No.* 2.

Sidereal chronometer No. 2557, fast:			
By 10 observations on α Lyræ, E. (at 15*h.* 32*m.*) using horizon roof No. 1, - - -	*h.* *m.* *s.* 1 01 30.12		
By 14 observations on α Bootis, W. (at 16*h.* 12*m.*) also using roof No. 1. - - -	1 01 30.41		
By E. and W. stars, using roof No. 1 (at 15*h.* 52*m.*) -	+1 01 30.26	*h.* *m.* *s.*	
		+1 01 30.26	
By 5 observations on α Lyræ, E., using horizon roof No. 2 (at 15*h.* 45*m.*) - - -	1 01 30.		
By 8 observations on α Bootis, W., using roof No. 2 (at 15*h.* 57*m.*)	1 01 30.22		
By E. and W. stars (at 15*h.* 51*m.*) using roof No. 2, .	+1 01 30.11		
		+1 01 30.11	
Result—Chronometer No. 2557, fast of sidereal time for this station (at 15*h.* 51*m.* 30*s.*) by 15 observations on α Lyræ, east, and 22 observations on α Bootis, west, - - -		+1 01 30.18	
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 8*h.* 28*m.* mean time)		−4 44.48	

9th. 1858, *July* 15*th.* *At Chicago Observing Station No.* 3.

Sidereal chronometer No. 2557, fast:		
By 7 observations on α Coronæ Borealis, W. (at 19*h.* 06*m.*) using horizon roof No. 1, - -	*h.* *m.* *s.* 1 01 46.54	
By 5 observations on α Andromedæ, E. (at 20*h.* 18*m.*) using also roof No. 1, - - -	1 01 44.96	

	h. m. s.	h. m. s.
By E. and W. stars (at 19*h*. 42*m*.) using horizon roof No. 1,	+ 1 01 45.75	
		+ 1 01 45.75
By 6 observations on α Coronæ Borealis, W. (at 19*h*. 24*m*.) using horizon roof No. 2, - - -	1 01 46.04	
By 9 observations on α Andromedæ, E. (at 20*h*. 02*m*.) using also horizon roof No. 2, - - -	1 01 45.31	
By E. and W. stars (at 19*h*. 43*m*.) using horizon roof No. 2,	+ 1 01 45.68	
		+ 1 01 45.68
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h*. 42*m*. 30*s*.) by 13 observations on α Coronæ Borealis, W., and 14 observations on α Andromedæ, E. - -		+ 1 01 45.71
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 12*h*. 07*m*. mean time),		— 4 44.58

10*th*. 1858, *July* 18*th*. ***At Chicago Observing Station No. 2.***

Sidereal chronometer No. 2557, fast:	h. m. s.	h. m. s.
By 9 observations on α Lyræ, E. (at 15*h*. 58*m*.) - - -	1 02 01.85	
By 14 observations on α Cygni, also E. (at 17*h*. 18*m*.) - -	1 02 01.75	
		1 02 01.8
By 23 observations on 2 East stars (at 16*h*. 38*m*.)		
By 19 observations on α Bootis, W. (at 16*h*. 34*m*.)		1 02 01.42
Result—Chronometer No. 2557, fast of sidereal time for this station (at 16*h*. 36*m*.) -		+ 1 02 01.61
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 8*h*. 49*m*.) -		— 4 43.01

11*th*. 1858, *July* 21*st*. *At same Station, No.* 2.

Sidereal chronometer No. 2557, fast:		
By 7 observations on α Bootis, W. (at 16*h*. 37*m*.) using horizon roof No. 1, - - -	*h. m. s.* 1 02 17.31	
By 8 observations on α Cygni, E. (at 17*h*. 19*m*.) using, also, horizon roof No. 1, - - -	1 02 18.39	
By E. and W. stars (at 16*h*. 58*m*.) with horizon roof No. 1,	+ 1 02 17.85	*h. m. s.* + 1 02 17.85
By 8 observations on α Bootis, W. (at 16*h*. 50*m*.) with roof No. 2, -	1 02 17.68	
By 8 observations on α Cygni, E. (at 17*h*. 02*m*.) also with roof No. 2,	1 02 18.03	
By E. and W. stars (at 16*h*. 56*m*.) using horizon roof No. 2,	+ 1 02 17.85	+ 1 02 17.85
Result—Chronometer No. 2557, fast of sidereal time for this station (at 16*h*. 57*m*.) by 15 observations on α Bootis, west, and 16 observations on α Cygni, east, - - - - - -		+ 1 02 17.85
By comparison—Mean solar chronometer No. 141, slow of mean solar time for this station (at 8*h*. 58*m*. mean time) - - - -		— 4 41.75

12*th*. 1858, *September* 5*th*. *At Chicago Observing Station No.* 3.

Sidereal chronometer No. 2557, fast:	
By 10 observations on α Coronæ Borealis, W. (at 19*h*. 04*m*.) - - - - - -	*h. m. s.* 1 06 53.8
By 12 observations on α Andromedæ, E. (at 20*h*. 25*m*.) - - - - -	1 06 54.7
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h*. 45*m*.) - -	+ 1 06 54.25
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 8*h*. 45*m*. mean time),	— 4 28.5

13*th.* 1858, *September 7th. Same Station, No.* 3.

Sidereal chronometer No. 2557, fast:		
By 9 observations on α Andromedæ, east (at 20*h.* 24*m.*) - - - - -		*h. m. s.* 1 07 06.7
By 15 observations on α Lyræ, W. (at 22*h.* 21*m.*) - - -	*h. m. s.* 1 07 06.51	
By 8 observations on α Aquilæ, also W. (at 22*h.* 23*m.*) - -	1 07 06.53	
By 23 observations on 2 West stars (at 22*h.* 22*m.*) . -	1 07 06.52	
		1 07 06.52
Result—Chronometer No. 2557, fast of sidereal time for this station (at 21*h.* 23*m.*) -		+ 1 07 06.62
By comparison—Chronometer No. 141, slow of mean solar time for this station (at 10*h.* 15*m.* mean time)		— 4 28.36

I would have preferred α Coronæ Borealis, W. for combination with α Andromedæ, E., as they are nearly of the same north declination, but clouds in the early part of the night obscured him.

Rates of the Chronometers.

As the rates of the two chronometers are necessarily introduced into the computations, it is proper that they should be here exhibited as derived from the foregoing observations made at Chicago.

They are as follows, viz.—

1st. Rates of Sidereal Chronometer No. 2557.

1858.		Elapsed Sidereal interval.	Rate per 24 Sidereal Hours.
From	To	Days and Decimals.	Gaining.
			s.
June 20,	June 22,	1.998	+ 6.05
June 22,	June 28,	6.000	+ 6.14
June 28,	June 30,	2.162	+ 6.15
June 30,	July 3,	2.870	+ 5.66
July 3,	July 5,	2.127	+ 6.07
July 5,	July 7,	1.837	+ 5.27
July 7,	July 12,	5.000	+ 6.10
July 12,	July 15,	3.160	+ 4.91
July 15,	July 18,	2.871	+ 5.54
July 18,	July 21,	3.014	+ 5.39
September 5,	September 7,	2.079	+ 6.00

2d. Rates of Mean Solar Chronometer No. 141.

1858.		Elapsed Mean Solar interval.	Rate per 24 Mean Solar Hours.
From	To	Days and Decimals.	+ Gaining. — Losing.
			s.
June 20,	June 22,	1.992	+ 0.37
June 22,	June 28,	5.983	+ 0.76
June 28,	June 30,	2.155	+ 0.30
June 30,	July 3,	2.860	+ 0.90
July 3,	July 5,	2.120	+ 0.54
July 5,	July 7,	1.833	+ 0.32
July 7,	July 12,	4.986	+ 0.86
July 12,	July 15,	3.152	— 0.03
July 15,	July 18,	2.862	+ 0.55
July 18,	July 21,	3.006	+ 0.42
September 5,	September 7,	2.064	+ 0.07

I will now present, in the same brief form as in the case of Chicago (I.), the observations that were made to ascertain the latitude and longitude of the other stations, following the order laid down at the beginning of this paper. It is the order in which the places occur in going from south to north.

II. MICHIGAN CITY, INDIANA.

The station occupied was on the summit of a sand hill, about 350 yards north-easterly from the rail road depot. A connection will be made by survey, as soon as convenient, between the observing station and one of the church steeples, and will be reported.

1*st. Observations for the Latitude.* 1858, *June* 21*st.*

By 10 observed circum-meridian altitudes of β Libræ, south, combined with 5 observed altitudes of Polaris (α Ursæ Minoris), north; latitude (approximate) - - - - -	41° 43′ 25″

2*d. Observations for the Time. Same Night.*

Sidereal chronometer No. 2557, fast:	*m.*	*s.*
By 13 observations on α Lyræ, east (at 15*h.* 36*m.*)	56	31.4
By 14 observations on α Bootis, west (at 16*h.* 08*m.*)	56	30.5
Result—Sidereal chronometer No. 2557, fast of sidereal time for this station (at 15*h.* 52*m.*) - -	+ 56	30.95

3*d. The Longitude.*

This was determined the same night by chronometrical connections with the meridian of Chicago, by means of electric signals transmitted each way by the telegraph wires. The times at the two stations were derived from the above observations made this night at Michigan city, and the observations made at Chicago on the nights of the 20th and 22d inst. above given, which also determine the rates of the two chronometers for reduction to the times of the signals.

The whole operation is shown as follows, viz.—

Determination of the difference of Longitude between Chicago and Michigan City, Indiana, by electric signals for comparisons of time, June 21st, 1858.

Sidereal Chronometer No. 2557, fast, of Michigan City, sidereal time, (at 16*h*. 57*m*. sidereal time,) + 56*m*. 31*s*.22.

Rate per sidereal day, + 6*s*.05; or per sidereal hour, + 0*s*.250.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 10*h*. 54*m*. mean time,) — 4*m*. 58*s*.68.

Rate per mean solar day, + 0.37*s*; or per mean solar hour, + 0*s*.015.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Michigan City by sidereal Chronometer No. 2557.	Michigan City correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Michigan City east of the meridian of Chicago.
h. m. s	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 00 00	11 04 58.68	18 04 44.5	17 08 13.23	17 05 19.45	0 02 53.78
11 18 00	11 22 58.68	18 22 47.5	17 26 16.16	17 23 22.40	0 02 53.76
12 02 30	12 07 28.67	19 07 25.	18 10 53.47	18 07 59.70	0 02 53.77
12 05 30	12 10 28.67	19 10 25.5	18 13 53.96	18 11 00.20	0 02 53.76
12 11 30	12 16 28.66	19 16 26.5	18 19 54.93	18 17 01.17	0 02 53.76
12 14 30	12 19 28.66	19 19 27.	18 22 55.42	18 20 11.66	0 02 53.76
12 17 20	12 22 18.66	19 22 17.5	18 25 45.91	18 22 52.13	0 02 53.78
12 20 40	12 25 38.66	19 25 38.	18 29 06.40	18 26 12.67	0 02 53.73

1st Mean.—Electric signals sent from Chicago to Michigan City, 0 02 53.763

2d.—Michigan City signals recorded at both stations.

Times of signals given at Michigan City, by sidereal Chronometer No. 2557.	Times of Michigan City signals as noted at Chicago, by mean solar Chronometer No. 141.	Chicago correct mean solar time of Michigan City signals.	Chicago reduced sidereal time of Michigan City signals.	Michigan City correct sidereal time of Michigan City signals.	Difference of Longitude by each signal.—Michigan City east of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m s.*	*h. m. s.*	*h. m. s.*
17 53 30	10 48 47.5	10 53 46.18	16 54 05.11	16 56 58.78	0 02 53.67
18 49 30	11 44 38.	11 49 36.67	17 50 04.77	17 52 58.55	0 02 53.78
18 53 00	11 48 07.5	11 53 06.17	17 53 34.84	17 56 28.53	0 02 53.69

2d Mean.—Electric signals sent from Michigan City to Chicago, 0 02 53.713

1st Mean.—Electric signals sent from Chicago to Michigan City, as above, - - - - - - 0 02 53.76

Result:—Michigan City Observing Station, east in longitude of Chicago observing Station No. 2, by a mean of the two sets of signals, - - - - - - 0 02 53.74

	h.	m.	s.
Brought forward,	— 0	02	53.74
Chicago observing station No. 2, west of the meridian of Greenwich,	+ 5	50	31.15
Result—Michigan city observing station, west of the meridian of Greenwich,	+ 5	47	37.41

Equal, in arc, to	86°	54′	21″.15 W.
Latitude (approximate) of the same station, as above,	41°	43′	25″ N.

III. WAUKEGAN, ILLINOIS.

The point of observation here was 111 feet north of the parallel of, and 103 feet west of the meridian of, the dome of the Court House, = 1″.1 difference of latitude; and 0*s*.09 in time, difference of longitude.

1st. Observations for the Latitude. 1858, *June 29th.*

	°	′	″
By 3 observed circum-meridian altitudes of β Libræ, south,	42	21	41.6
By 11 observed circum-meridian altitudes of α Ophiuchi, also south,	42	21	44.

	°	′	″
Mean from 2 south stars,	42	21	42.8
By 10 observed altitudes of Polaris (α Ursæ Minoris) north,	42	21	46.7
Result—Latitude of station,	42	21	44.8
Reduction to the dome of the Court House,			— 1.1
Latitude of Waukegan Court House,	42	21	43.7

2d. Observations for the Time.

Sidereal chronometer No. 2557, fast:	h.	m.	s.
By 13 observations on α Lyræ, east (at 15*h*. 44*m*.)	1	01	04.08
By 12 observations on α Bootis, west (at 16*h*. 19*m*.)	1	01	03.22
Result—Sidereal chronometer No. 2557, fast of sidereal time for this observing station (at 16*h*. 01*m*.)	+ 1	01	03.65

3d. *The Longitude.*

Reference must be made to the observations for the time at this place as above given, and to those of June 28th, and June 30th, at Chicago. They furnish the data for the times at each station, applied to the following telegraphic signals exchanged between Chicago and Waukegan, viz:

Determination of the difference of Longitude between Chicago and Waukegan, Illinois, by electric signals for comparison of time, June 29th, 1858.

Sidereal Chronometer No. 2557, fast of Waukegan sidereal time (at 18*h*. 29*m*. sidereal time), 1*h*. 01*m*. 04*s*.28.

Rate per sidereal day, + 6.15*s*. or per sidereal hour, + 0*s*.2506.

Mean Solar Chronometer No. 141, slow of Chicago mean solar time (at 11*h*. 58*m*. mean time), 04*m*. 53*s*.42.

Rate per mean solar day, + 0*s*.30. or per mean solar hour, 0*s*.0125.

1st.—Chicago signals recorded at both stations.

Times of Signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Waukegan, by sidereal Chronometer No. 2557.	Waukegan correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal. Waukegan, west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 53 20	11 58 13.42	19 30 30	18 29 25.72	18 30 15.40	0 00 49.68
11 56 20	12 01 13.42	19 33 30.5	18 32 26.20	18 33 15.90	0 00 49.70
11 59 20	12 04 13.42	19 36 31	18 35 26.69	18 36 16.39	0 00 49.70
1st Mean.—Electric signals sent from Chicago to Waukegan, Ill.					0 00 49.69

2d.—Waukegan, Illinois, signals recorded at both stations.

Times of signals given at Waukegan, by sidereal Chronometer No. 2557.	Times of Waukegan signals, as noted at Chicago, by mean solar Chronometer No. 141.	Chicago correct mean solar time of Waukegan signals.	Chicago reduced sidereal time of Waukegan signals.	Waukegan correct sidereal time of Waukegan signals.	Difference of Longitude by each signal. Waukegan, west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
19 45 25	12 08 12.5	12 13 05.91	18 45 10.34	18 44 20.65	0 00 49.69
19 48 25.5	12 11 12.5	12 16 05.91	18 48 10.83	18 47 21.14	0 00 49.69
19 51 26	12 14 12.5	12 19 05.91	18 51 11.32	18 50 21.63	0 00 49.69
19 54 26.5	12 17 12.5	12 22 05.91	18 54 11.81	18 53 22.12	0 00 49.69
2d Mean.—Electric signals sent from Waukegan, Ill. to Chicago,					0 00 49.69
1st Mean.—Electric signals sent from Chicago to Waukegan as above,					0 00 49.69

Result:—Waukegan Station, Illinois, west in longitude of Chicago observing station No. 2, by a mean of the two sets of signals, + 0 00 49.69

	h.	m.	s.
Brought forward,	+ 0	00	49.65
Reduction to Waukegan Court House, - -			— 0.09
Waukegan Court House, west of the meridian of Chicago observing station No. 2, -	+ 0	00	49.56
Longitude of Chicago observing station No. 2, west of the meridian of Greenwich, -	+ 5	50	31.15
Longitude of Waukegan Court House, west of the meridian of Greenwich, - - -	5	51	20.71
Equal, in arc, to - - -	87° 50′ 10″.65 W.		
Latitude, as before, - - -	42° 21′ 43″.7 N.		

Other points at Waukegan, connected with the dome of the Court House by survey, are obtained for the following table, viz.—

POSITIONS IN WAUKEGAN.	Latitude North.	Longitude West of the Meridian of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1st. Dome of Waukegan Court House, - - - - - - - - -	42 21 43.7	87 50 10.65	5 51 20.71
2d. Steeple of the Roman Catholic Church on County Street, between Water and Washington Streets, - - - - - - - - -	42 21 37.7	87 50 11.44	5 51 20.76
3d. Intersection of the middle of Genesee Street with the middle of Washington Street, - - -	42 21 41.	87 50 05.8	5 51 20.38
4th. The Light House, - - - -	42 21 29.3	87 49 59.97	5 51 20.
5th. Intersection of the middle of Madison Street with the shore of Lake Michigan, - - - - -	42 21 44.2	87 49 39.93	5 51 18.66

IV. RACINE, WISCONSIN.

The observing station here, is S. 44° 42′ 40″ E. 100 feet from the middle of the base of the tower of Saint Luke's Church (Episcopal); and it is N. 87° 05′ E. and distant 297 feet from the dome of the Racine Court House, situated 100 feet west of the west margin of Main street, between 5th and 6th streets.

1*st. Observations for the Latitude.* 1858, *September* 6*th.*

	°	′	″
By 11 observed circum-meridian altitudes of Altair (α Aquilæ) south,	42	43	46.3
By 11 observed circum-meridian altitudes of γ Cephei, north,	42	43	43.1
Result—Latitude of station,	42	43	44.7 N.
Reduction to the dome of the Court House,			— 0.1
Latitude of Racine Court House,	42	43	44.6

2*d. Observations for the Time. Same Night.*

Sidereal chronometer No. 2557, fast:	*h.*	*m.*	*s.*
By 13 observations on α Coronæ Borealis, west (at 19*h.* 07*m.*)	1	07	36.69
By 9 observations on α Andromedæ, east (at 20*h.* 26*m.*)	1	07	37.1
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h.* 46*m.*)	+ 1	07	36.9

3*d. The Longitude.*

Reference must be made to the above observations made this night for the Racine time, and to the observations before recorded, of the 5th and 7th of September, made at Chicago for the time there, and also to the following telegraphic signals, viz:

Determination of the difference of Longitude between Chicago and Racine, Wisconsin, by electric signals for comparisons of time, September 6th, 1858.

Sidereal Chronometer No. 2557, fast, of Racine, sidereal time, (at 22*h*. 24*m*. 40*s*. siderial time,) 1*h*. 07*m*. 37*s*.55.

Rate per sidereal day, + 6*s*.0 ; or per sidereal hour, + 0*s*.25.

Mean Solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 11*h*. 21*m*. mean time,) 4*m*. 28*s*.42.

Rate per mean solar day, + 0*s*.07 ; or per mean solar hour, + 00*s*.03.

1st.—Chicago signals recorded at both stations.

Times of Signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Racine by siderial Chronometer No. 2557.	Racine correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Racine West of the meridian of Chicago.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
11 16 50	11 21 18.42	23 32 17.5	22 24 39.95	22 25 16.75	0 00 36.80
11 19 40	11 24 08.42	23 35 08.	22 27 30.43	22 28 07.22	0 00 36.79
11 31 40	11 36 08.42	23 47 10.	22 39 32.38	22 40 09.19	0 00 36.81
11 34 42	11 39 10.42	23 50 12.5	22 42 34.87	22 43 11.68	0 00 36.81
11 37 41	11 42 09.42	23 53 12.	22 45 34.36	22 46 11.17	0 00 36.81

1st Mean.—Electric signals sent from Chicago to Racine, 0 00 36.804

2d.—Racine signals recorded at both stations.

Times of signals given at Racine by sidereal Chronometer No. 2557.	Times of Racine signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Racine signals.	Chicago reduced sidereal time of Racine signals.	Racine correct sidereal time of Racine signals.	Difference of Longitude by each signal.—Racine West of the meridian of Chicago.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
23 38 08.5	11 22 40.	11 27 08.42	22 31 07.71	22 30 30.92	0 00 36.79
23 41 09.	11 25 40.	11 30 08.42	22 34 08.20	22 33 31.41	0 00 36.79
23 44 10.5	11 28 41.	11 33 09.42	22 37 09.69	22 36 32.90	0 00 36.79

2d Mean.—Electric signals sent from Racine to Chicago, 0 00 36.79

1st Mean.—Electric signals sent from Chicago to Racine, as above, 0 00 36.804

Result :—Racine observing station is west, in longitude of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - + 0 00 36.80

	h.	m.	s.
Brought forward,	+ 0	00	36.8
Reduction to the dome of Racine Court House,			+ 0.26
Sum,	0	00	37.06
Longitude of Chicago observing station No. 3, west of the meridian of Greenwich, - -	+ 5	50	31.2
Longitude of Racine Court House, west of the meridian of Greenwich, - - - -	5	51	08.26
Equal, in arc, to - - - -	87°	47′	04″
Latitude, as above, - - - -	42°	43′	44″.6

From the above, and our survey, we present the following table of positions in Racine, viz.

POSITIONS IN RACINE.	North Latitude.	Longitude West of the Meridian of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1st. Dome of the Court House, -	42 43 44.6	87 47 04	5 51 08.26
2d. Tower of St. Luke's Church (Episcopal), - - - - - - - -	42 43 45.4	87 47 01	5 51 08.06
3d. Steeple of the Universalist Church of the Good Shepherd, -	42 43 44.3	87 47 00.9	5 51 08.06
4th. The Light House, - - - -			

The American Almanac for the present year, and for many years past, gives Racine as being in latitude 42° 49′ 33″ N. Longitude west of Greenwich, 87° 40′ 22″ which is an error in the assigned position of this place of eight and three-fourths ($8\frac{3}{4}$) miles in an azimuthal direction of N. 40° 25′ east, of its true position.

V. MILWAUKEE, WISCONSIN.

This is the second city in magnitude, population and commerce, on Lake Michigan, being next to Chicago. It is also the largest city in the State of Wisconsin. Its population is now near fifty thousand (50,000) souls. It is very important that its position should be correctly laid down on the maps of our country.

I was obliged to occupy three different stations in the course of the observations made here, for reasons which will be stated in turn. The observations at each were reduced to the position of the tall and conspicuous steeple of the Roman Catholic Church on Jackson street, between Oneida and Biddle streets. This church is of permanent structure, and was therefore selected as a monument for reference.

1858, *June 23d. At Milwaukee Station No.* 1.

This station is in a vacant lot near the north-east corner of Milwaukee and Mason streets. The intersection of the middle lines or axes of these two streets, is 115 feet south of the parallel, and 107 feet west of the meridian of this observing station No. 1.

The middle point of the base of the tall steeple of the Roman Catholic Church on Jackson street, is by horizontal measurement, 545 feet = 5″.38 of arc in latitude north of the parallel, and 557 feet = 7″.5 of arc = 0*s*.5 of time east of the meridian of this observing station No. 1.

The observations made this night, for the latitude at this station, were not conclusive. I obtained here 14 circum-meridian altitudes of the star β Libræ, culminating south of the zenith, but clouds prevented observations on α Ursæ Minoris (Polaris) north; therefore those on β Libræ were rejected, although they gave the latitude of this station only 4″.6 less than it was afterwards made by a reduction to this point, of satisfactory observations at stations Nos. 2 and 3, as will presently appear.

1. *Observations for the Time at Milwaukee Station No.* 1.

	h.	*m.*	*s.*
Sidereal chronometer No. 2557, fast:			
By 10 observations on α Lyræ, east (at 15*h*. 42*m*. sidereal time) - - - - -	1	00	43.5
By 15 observations on α Bootis, west (at 16*h*. 08*m*. sidereal time) - - - - -	1	00	42.52
Result—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 55*m*. sidereal time, June 23d) - - - - - -	+ 1	00	43.

2*d. The Longitude.*

The above determination of the time for this Milwaukee station, and the time at Chicago, derived from the observations of June 22d and 28th, already given, together with the comparisons of time for the two places by the following telegraphic signals, give us the data for the difference of longitude.

The elapsed time between the two periods of observation at Chicago, fixing the rate of mean solar chronometer No. 141, was greater than I would have wished, but I could not diminish it.

Determination of the difference of Longitude between Chicago and Milwaukee, by electric signals for comparisons of time, June 23d, 1858.

Sidereal Chronometer No. 2557, fast, of Milwaukee, sidereal time, (at 17*h*. 39*m*. sidereal time,) 1*h*. 00*m*. 43*s*.46.

Rate per sidereal day, + 6*s*.14; or per sidereal hour, + 0*s*.251.

Mean Solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 11*h*. 32*m*. mean time,) 4*m*. 57*s*.51.

Rate per mean solar day, + 0*s*.76; or per mean solar hour, + 0*s*.0317.

1st.—Milwaukee signals recorded at both stations.

Times of signals given at Milwaukee by sidereal Chronometer No. 2557.	Times of Milwaukee signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Milwaukee signals.	Chicago reduced sidereal time of Milwaukee signals.	Milwaukee correct sidereal time of Milwaukee signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
18 40 00.	11 27 07.5	11 32 05.01	17 40 23.35	17 39 16.54	0 01 06.81
18 43 00.	11 30 07.	11 35 04.51	17 43 24.34	17 42 16.53	0 01 06.81
1st Mean.—Electric signals sent from Milwaukee to Chicago,					0 01 06.81

2d.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Milwaukee by sidereal Chronometer No. 2557.	Milwaukee correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
11 48 00.	11 52 57.50	19 00 56.	18 00 12.47	18 01 19.27	0 01 06.80
12 15 00.	12 19 57.49	19 28 00.5	18 27 16.85	18 28 23.69	0 01 06.84
12 18 00.	12 22 57.49	19 31 01.	18 30 17.33	18 31 24.19	0 01 06.86
12 23 50.	12 28 47.48	19 36 52.	18 36 08.31	18 37 15.14	0 01 06.83
12 30 00.	12 34 57.48	19 43 03.	18 42 19.28	18 43 26.15	0 01 06.87
12 35 50.	12 40 47.47	19 48 54.	18 48 10.26	18 49 17.10	0 01 06.84
12 38 40.	12 43 37.47	19 51 44.5	18 51 00.75	18 52 07.57	0 01 06.82
2d Mean.—Electric signals sent from Chicago to Milwaukee,					0 01 06.83
1st Mean.—Electric signals sent from Milwaukee to Chicago, as above, - - - - - - - -					0 01 06.81

Result:—Milwaukee Station No. 1, west, in longitude of Chicago observing Station No. 2, by a mean of the two sets of signals, + 0 01 06.82

	h.	m.	s.
Brought forward,	+ 0	01	06.82
Reduction to the steeple of the Roman Catholic Church on Jackson street, Milwaukee, -			— 0.5
Steeple of this church is west of the meridian of Chicago station No. 2, - - - -	+ 0	01	06.32
Longitude of Chicago station No. 2, west of the meridian of Greenwich, - - - -	+ 5	50	31.15

Determination 1*st.*

Longitude of the steeple of the Roman Catholic Church on Jackson street, Milwaukee, west of the meridian of Greenwich, - - -	+ 5	51	37.47

It will be seen that the coincidence in the results from the seven electric signals sent from Chicago to Milwaukee, in the above series, is not so close as those previously given in the cases of Waukegan and Racine, or as those which follow, for subsequent dates, as given from Chicago to Milwaukee.

There is an extreme difference in the results derived from the seven sent on the 23d of June from Chicago to Milwaukee, of seven one-hundredths ($\frac{7}{100}$) of a second of time. This I attribute to the little practice which the telegraph operator at Chicago had had, at that date, in this species of experiments.

On the afternoon of June 30th, I received information which made it necessary that I should go again to Milwaukee on public business. The journey afforded another opportunity to try the difference of longitude between that place and Chicago, by two new sets of observations entirely independent of those from which the above result is derived.

On the night of June 30th (being the night before I started on my second visit to Milwaukee), and on the night of my return to Chicago, namely, July 3d, I made, at Chicago, the observations already given under those two dates. They, combined with the following observations made at Milwaukee, and the telegraphic signals passed on the the night of July 1st, and in the day of July 3d, give the two additional determinations mentioned.

Observations for the Time at Milwaukee Station No. 2, July 1st, 1858.

This station was more convenient to my lodgings than No. 1. It is the centre, or point of intersection of the public walks, of the Court House Square.

From this point, if we run due east 235 feet, and then due north 29 feet, it will bring us perpendicularly under the apex of the steeple of the Roman Catholic Church on Jackson street. Hence, this steeple is 0″.29 north of the parallel, and 3″.165 of arc = 0*s*.21 of time east of the meridian of this observing station No. 2.

A point perpendicularly under the middle of the dome of the court house is due north 123 feet = + 1″.2 of latitude from this station No. 2.

The night was not very favourable for observations for the time. Passing clouds frequently obscured the stars which I desired to observe near the east and west prime vertical for that object. I could only get a single observation on α Andromedæ in the east, to balance against 5 observations on α Bootis, and 8 on α Coronæ Borealis, both in the west, for computing the time this night.

The sky to the north and the south was clearer, and hence more favourable to the observations for the latitude.

1858, *July 1st. At Milwaukee Station No. 2.*

Sidereal chronometer No. 2557, fast:	*h.* *m.* *s.*	*h.* *m.* *s.*
By 5 observations on α Bootis, west (at 18*h*. 36*m*.) - -	1 01 33.	
By 8 observations on α Coronæ Borealis, also west (at 19*h*. 03*m*.)	1 01 32.7	
By 13 observations on 2 west stars (at 18*h*. 50*m*.)		+ 1 01 32.85
By 1 observation on α Andromedæ, east (at 20*h*. 56*m*.)		+ 1 01 33.31
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h*. 53*m*.) - -		+ 1 01 33.08

The following telegraphic signals were passed, before the observations for the time were made here. The weather was so cloudy, that no observations on the stars could be made previous to the time of night at which the telegraph was at our command for the signals. We had first to pass the signals, and take the chances of getting the time from observation afterwards.

Determination of the difference of Longitude between Chicago and Milwaukee, by electric signals for comparisons of time, July 1st, 1858.

Sidereal Chronometer No. 2557, fast, of Milwaukee, sidereal time, (at 17*h*. 18*m*. 48*s*. sidereal time,) 1*h*. 01*m*. 32*s*.47.

Rate per sidereal day, + 5*s*.66 ; or per sidereal hour, + 0*s*.236.

Mean Solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 10*h*. 40*m*. 12*s*. mean time,) 4*m*. 52*s*.27.

Rate per mean solar day, + 0*s*.90 ; or per mean solar hour, + 0*s*.0375.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Milwaukee by sidereal Chronometer No. 2557.	Milwaukee correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 35 20.	10 40 12.27	18 20 20.5	17 18 48.03	17 19 54.56	0 01 06.53
10 38 20.	10 43 12.27	18 23 21.	17 21 48.52	17 22 55.05	0 01 06.53
10 41 40.	10 46 32.27	18 26 41.5	17 25 09.01	17 26 15.60	0 01 06.59
10 44 10.	10 49 02.27	18 29 12.	17 27 39.50	17 28 46.01	0 01 06.51

1st Mean.—Electric signals sent from Chicago to Milwaukee, 0 01 06.54

2d.—Milwaukee signals recorded at both stations.

Times of signals given at Milwaukee by sidereal Chronometer No. 2557.	Times of Milwaukee signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Milwaukee signals.	Chicago reduced sidereal time of Milwaukee signals.	Milwaukee correct sidereal time of Milwaukee signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
18 35 25.	10 50 22.	10 55 14.25	17 34 59.01	17 33 52.47	0 01 06.54
18 38 25.5	10 53 22.	10 58 14.25	17 37 59.50	17 36 52.96	0 01 06.54
18 41 26.	10 56 22.	11 01 14.25	17 40 59.99	17 39 53.44	0 01 06.55
18 44 26.5	10 59 22.	11 04 14.25	17 44 00.48	17 42 53.93	0 01 06.55

2d Mean.—Electric signals sent from Milwaukee to Chicago, 0 01 06.545

1st Mean.—Electric signals sent from Chicago to Milwaukee, as above, - - - - - - 0 01 06.540

Result:—The centre of the Court House Square at Milwaukee, is west, in longitude of Chicago, observing Station No. 3, by a mean of the two sets of signals, - - - + 0 01 06.54

	h.	m.	s.
Brought forward,	+ 0	01	06.54
Reduction to the steeple of the Roman Catholic Church on Jackson street, Milwaukee, -			— 0.21
Steeple of the Roman Catholic Church, Milwaukee, west of the Chicago observing station No. 3,	+ 0	01	06.33
Longitude of Chicago station No. 3, west of the meridian of Greenwich, - - - -	+ 5	50	31.2

Determination 2d.

Longitude of the steeple of the Roman Catholic Church on Jackson street, Milwaukee, west of the meridian of Greenwich, - - -	5	51	37.53

My duties detained me at Milwaukee until the afternoon rail road train of July 3d. The night of the 2d was cloudy, and part of it rainy, and not a star could be seen.

The 3d was clear, so I determined to try the result of a third series of telegraphic signals for the difference of longitude between the two places, which should rest for the Milwaukee time, on a set of equal altitudes of the sun observed with the sextant and artificial horizon, A. M. and P. M. The signals were passed by telegraph between the periods of the forenoon and afternoon observations.

I could not observe in the day time, either in the court house yard, or at station No. 1 of June 23d, because there were so many carriages, drays and persons on foot, constantly passing near by, that the artificial horizon of quicksilver was, I found while at those stations during the day, kept constantly agitated.

I was obliged therefore, to seek a more quiet position than either of those two. This I found in a vacant lot at the north east corner of Jackson and Martin streets.

The position here occupied I call Milwaukee Station No. 3. It is 890 feet north of the parallel, and 38 feet east of the meridian of the steeple before mentioned. Hence the reduction from this station No. 3, to the said steeple is — 8″.8 in latitude, and + 0″.512 of arc = + 0s.034 of time, in longitude.

The equal altitudes of the sun we accordingly observed as follows, viz:

1858, *July 3d. At Milwaukee Observing Station No. 3.*

Equal altitudes of the Sun, A. M. and P. M.

Observed double altitudes of the Sun's upper and lower limbs.	Times by sidereal Chronometer No. 2557 of equal altitudes of the Sun.		Elapsed sidereal time.	Equation of equal altitudes, in sidereal time.	Time by Chronometer of apparent noon.	Sidereal time of apparent noon.	Chronometer fast of sidereal time at apparent noon.
	A. M.	P. M.					
	h. m. s.	*h. m. s.*	*h. s.*	*s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
Up. limb, 106° 09′ 50″	5 18 55.8	10 23 45.6	5 05	+ 2.03	7 51 22.73	6 49 42.19	1 01 40.54
Up. limb, 106 58 10	5 21 17.9	10 21 23.8	5 00	+ 2.00	7 51 22.85	„ „ „	1 01 40.66
Lo. limb, 110 23 10	5 34 34.4	10 08 07.6	4 33	+ 1.93	7 51 22.97	„ „ „	1 01 40.78
Up. limb, 115 28 10	5 46 56.8	9 55 45.9	4 09	+ 1.89	7 51 23.24	„ „ „	1 01 41.05
Lo. limb, 115 28 10	5 50 12.3	9 52 29.6	4 02	+ 1.85	7 51 22.80	„ „ „	1 01 40.61

Result:—Chronometer No. 2557, fast, of sidereal time for the Milwaukee Observing Station No. 3, at apparent noon (say at 6*h.* 50*m.* sidereal time) of July 3d, 1858, by a mean of 5 pairs of equal altitudes of the Sun, - - - - - - - - - - + 1 01 40.73

Determination of the difference of Longitude between Chicago and Milwaukee, by electric signals for comparisons of time, July 3d, 1858.

Sidereal Chronometer No. 2557, fast, of Milwaukee, sidereal time, (at 8*h*. 00*m*. 47*s*. sidereal time,) 1*h*. 01*m*. 41*s*.01.

Rate per sidereal day, + 5*s*.66; or per sidereal hour, + 0*s*.236.

Mean Solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 1*h*. 15*m*. 51*s*. mean time,) 4*m*. 51*s*.06.

Rate per mean solar day, + 0*s*.90; or per mean solar hour, + 0*s*.0375.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Milwaukee by sidereal Chronometer No. 2557.	Milwaukee correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
1 11 00.	1 15 51.06	9 02 28.5	8 00 47.49	8 01 53.76	0 01 06.27
1 14 30.	1 19 21.06	9 05 59.	8 04 17.98	8 05 24.33	0 01 06.35
1 17 10.	1 22 01.06	9 08 39.5	8 06 58.47	8 08 04.77	0 01 06.30
1 20 00.	1 24 51.06	9 11 30.	8 09 48.95	8 10 55.23	0 01 06.28

1st Mean.—Electric signals sent from Chicago to Milwaukee, 0 01 06.30

2d.—Milwaukee signals recorded at both stations.

Times of signals given at Milwaukee by sidereal Chronometer No. 2557.	Times of Milwaukee signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Milwaukee signals.	Chicago reduced sidereal time of Milwaukee signals.	Milwaukee correct sidereal time of Milwaukee signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
9 17 35.	1 26 04.	1 30 55.05	8 17 00.22	8 15 53.93	0 01 06.29
9 20 35.5	1 29 04.	1 33 55.05	8 20 00.71	8 18 54.42	0 01 06.29
9 23 36.	1 32 04.	1 36 55.05	8 23 01.20	8 21 54.91	0 01 06.29
9 26 36.5	1 35 04.	1 39 55.05	8 26 01.69	8 24 55.40	0 01 06.29

2d Mean.—Electric signals sent from Milwaukee to Chicago, 0 01 06.29

1st Mean.—Electric signals sent from Chicago to Milwaukee, as above, - - - - - - - - 0 01 06.30

Result.—Milwaukee observing Station No. 3 is west, in longitude of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - + 0 01 06.3

	h.	m.	s.
Brought forward,	+ 0	01	06.30
Reduction to the said steeple, - - -			+ 0.03
Steeple, west of the meridian of Chicago observing station No. 3, - - - -	+ 0	01	06.33
Longitude of Chicago station No. 3, - -	+ 5	50	31.20

Determination 3d.

Longitude of the said steeple, west of the meridian of Greenwich, - - - - - -	5	51	37.53

Here are three singular coincidences in the determination of the difference of longitude between two places derived from time observations made with a sextant and an artificial horizon. We will present a fourth and then a summary of the whole.

I will first remark, that the time was obtained at Chicago afresh on my return hither on the night of the same day (July 3d); that the equal altitudes of the sun were observed and the signals passed, as will be seen by reference to the preceding record of the Chicago observations.

Late in the afternoon of July 5th, I was again summoned to go to Milwaukee on business connected with the harbour improvement there. I determined to make the journey the occasion of a fourth trial of the difference of longitude, by a set of observations that should render it entirely independent of the other three. Accordingly on the night of the 5th, I made the observations at Chicago given under that date in the preceding record.

My business in regard to the harbour improvement occupied me at Milwaukee all day of the 6th, and until the time for the afternoon train of cars to start for Chicago on the 7th. By that train I reached Chicago in time to make the observations already given under that date. They, and those of the 5th, gave a short run for the rate of the mean solar chronometer No. 141, at Chicago, and they also gave the absolute time for the meridian of Chicago within 21½ hours of the mean period of the telegraphic signals of the 6th.

After the duties of the day for the 6th were over at Milwaukee, I made the following observations for the time at station No. 3.

Two sets of time observations were made at that station this night, one set before exchanging the telegraphic signals with Chicago, and another set after those signals.

The mean of the two results was adopted for the mean period of the two sets, which corresponds very nearly (within half an hour) with the mean period of the signals, and thus leaves but that length of run of the sidereal chronometer between the period of getting its error from observation, and the mean period of the signals.

1858, *July 6th. Observations for the Time at Milwaukee Station No. 3.*

1st Set. Before the Telegraphic Signals.

Sidereal chronometer No. 2557, fast:	*h.*	*m.*	*s.*
By 12 observations on α Lyræ, east (at 15*h.* 39*m.*)	1	02	01.19
By 13 observations on α Bootis, west (at 16*h.* 04*m.*)	1	02	00.15
1st Result—Before the Signals—Chronometer No. 2557, fast of sidereal time for Milwaukee station No. 3 (at 15*h.* 52*m.*) - - -	+ 1	02	00.67

2d Set. After the Signals.

Sidereal chronometer No. 2557, fast:	*h.*	*m.*	*s.*
By 5 observations on α Coronæ Borealis, west (at 20*h.* 08*m.*) - - - - -	1	02	01.83
By 5 observations on α Andromedæ, east (at 20*h.* 22*m.*)	1	02	00.94
2d Result—After the Signals—Chronometer fast of sidereal time for this station (at 20*h.* 15*m.*)	+ 1	02	01.38
Do. do. (at 15*h.* 52*m.*) before the signals, as above, - - - - -	+ 1	02	00.67
Result adopted—Chronometer No. 2557, fast of sidereal time for Milwaukee station No. 3 (at 18*h.* 03*m.*) July 6th, - - - -	+ 1	02	01.

The above result for the time at Milwaukee, combined with the Chicago time-observations of July 5th and 7th, and applied to the following telegraphic signals, give us a fourth determination of the difference of longitude between Chicago and Milwaukee, entirely independent of the other three, as follows, viz.

Determination of the difference of Longitude between Chicago and Milwaukee, by electric signals for comparisons of time, July 6th, 1858.

Sidereal Chronometer No. 2557, fast, of Milwaukee, sidereal time, (at 17*h*. 03*m*. 22*s*. sidereal time,) 1*h*. 02*m*. 00*s*.78.

Rate per sidereal day, + 5*s*.27; or per sidereal hour, + 0*s*.22.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 10*h*. 05*m*. mean time,) — 4*m*. 49*s*.1.

Rate per mean solar day, + 0.32*s*; or per mean solar hour, + 0*s*.0133.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Milwaukee by sidereal Chronometer No. 2557.	Milwaukee correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 00 20	10 05 09.1	18 05 23.	17 03 22.22	17 04 28.42	0 01 06.20
10 03 20	10 08 09.1	18 08 23.5	17 06 22.71	17 07 28.91	0 01 06.20
10 06 20	10 11 09.1	18 11 24.	17 09 23.20	17 10 29.41	0 01 06.21
10 09 20	10 14 09.1	18 14 24.5	17 12 23 69	17 13 29.90	0 01 06.21
10 12 10	10 16 59.1	18 17 15.	17 15 14.18	17 16 20.37	0 01 06.19

1st Mean.—Electric signals sent from Chicago to Milwaukee, 0 01 06.202

2d.—Milwaukee signals recorded at both stations.

Times of signals given at Milwaukee by sidereal Chronometer No. 2557.	Times of Milwaukee signals as noted at Chicago, by mean solar Chronometer No. 141.	Chigago correct mean solar time of Milwaukee signals.	Chicago reduced sidereal time of Milwaukee signals.	Milwaukee correct sidereal time of Milwaukee signals.	Difference of Longitude by each signal.—Milwaukee west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m s.*	*h. m. s.*	*h. m. s.*
18 23 15.	10 18 09.	10 22 58.09	17 22 20.34	17 21 14.15	0 01 06.19
18 26 15.	10 21 08.5	10 25 57.59	17 25 20.33	17 24 14.14	0 01 06.19
18 29 16.	10 24 09.	10 28 58.09	17 28 21.32	17 27 15.13	0 01 06.19
18 32 16.5	10 27 09.	10 31 58.09	17 31 21.82	17 30 15.62	0 01 06.20
18 35 17.	10 30 09.	10 34 58.09	17 34 22.31	17 33 16.11	0 01 06.20

2d Mean.—Electric signals sent from Milwaukee to Chicago, 0 01 06.194

1st Mean.—Electric signals sent from Chicago to Milwaukee as above, - - - - - - 0 01 06.202

Result:—Milwaukee Station No. 3, west in longitude of the meridian of Chicago observing Station No. 3, by a mean of the two sets of signals this night, - - + 0 01 06.20

	h.	m.	s.
Brought forward,	+ 0	01	06.20
Reduction to the church steeple as before (see Determination 3d) - - - - - -			+ 0.03
Steeple, west of the meridian of Chicago observing station No. 3, - - - -	+ 0	01	06.23
Longitude of Chicago observing station No. 3, -	5	50	31.20

Determination 4th.

Longitude of the said steeple, west of the meridian of Greenwich, - - - - - -	5	51	37.43

SUMMARY. Longitude of this steeple:

By Determination 1st, of June 23d, 1858, -	5	51	37.47
By Determination 2d, of July 1st, „ -	5	51	37.53
By Determination 3d, of July 3d, „ -	5	51	37.53
By Determination 4th, of July 6th, „ -	5	51	37.43

Mean, giving each determination an equal weight.

Longitude of the steeple of the Roman Catholic Church on Jackson street, Milwaukee, west of the meridian of Greenwich, - -	5*h*. 51*m*. 37*s*.5
Equal, in arc, to - - -	87° 54′ 22″.5

I confess I was surprised, when the several computations were completed, at the very close coincidence of these four determinations. They may be due, in some measure, to a fortunate concurrence of circumstances of which I am altogether unconscious. No one can expect such results, always, from observations with a sextant of the ordinary size, depending on the steadiness of the hand for its support; yet I do not hesitate to say, from long experience in observing with astronomical instruments—both portable and those permanently mounted on stone pillars—that the correct time may be obtained by a practised observer, with a good sextant and artificial horizon, within a small fraction of a second, by twenty or thirty minutes time spent in observing on two stars of nearly the same declination, whose places, as given in the catalogues, are well determined—the one to be

observed when near the east and the other when near the west prime-vertical.

I also believe, from long experience, that the latitude of a place may be ascertained by a few hours' work in a single clear night, with the same apparatus and a good time-keeper—either a first quality pocket watch, or a chronometer—to withinone hundred or one hundred and fifty yards of space, measured on the meridian; that is to say, to within 3″ to 4″.5 of arc. This is quite near enough for the projection of geographical maps, even on the largest scale usually adopted. Even a nearer approximation often occurs from such instruments and observations, by a few hours' work in a single night.

By a series of observations on four pairs of stars, well chosen under the rule before given—a condition that may often be secured in two consecutive nights—the latitude may, we believe, be ascertained, with such an apparatus, to within one second of arc.

There is such a vast extent of our country whose geography is very imperfectly laid down, that this peculiar branch of practical astronomy should be much encouraged amongst our countrymen who travel either for purposes of scientific research, or for pleasure and amusement. The requisite apparatus is easily transported, and may be packed within the space of an ordinary travelling valise, except the time-keeper, which should essentially be carried in a wheeled vehicle, either in hand, or on the person of the traveller.

3*d*. *Observations for the Latitude of Milwaukee.*

These were made on the nights of the 1st and 6th of July, at stations No. 2 and No. 3, already described, as follows, viz.

1858, *July* 1*st*. *At Milwaukee Station No.* 2, *in the middle of the Court House Square.*

	°	′	″
By 18 circum-meridian altitudes of α Aquilæ (Altair) south,	43	02	30.2
By 12 altitudes of α Ursæ Minoris (Polaris) north,	43	02	36.8
Result—Latitude of station, by this night's observations,	43	02	33.5
Reduction to the steeple of the Roman Catholic Church on Jackson street,			+ 0.29
Latitude of this church steeple by this night's observations,	43	02	33.79

1858, *July 6th. At Milwaukee Station No. 3.*

	°	′	″
By 17 altitudes of α Ursæ Minoris (Polaris) north,	43	02	39.12
By 26 circum-meridian altitudes of α Aquilæ (Altair) south,	43	02	45.77
Result—Latitude of this station,	43	02	42.45
Reduction to the steeple of the Roman Catholic Church on Jackson street,			— 8.8
Latitude of this steeple by this night's observations,	43	02	33.65
Do. by the observations of July 1st, above given,	43	02	33.79
Result adopted—Latitude of the steeple of the Roman Catholic Church on Jackson street, Milwaukee, by a mean of both nights' observations,	43	02	33.7
Longitude of the same, west of the meridian of Greenwich, as before given, $5h.\ 51m.\ 37s.5$ =	87	54	22.5

From these two last expressed results, combined with our harbour survey, we present the following table of positions in the city of Milwaukee.

POSITIONS IN MILWAUKEE.	North Latitude.	Longitude West from the Meridian of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1st. Steeple of the Roman Catholic Church on Jackson Street,	43 02 33.7	87 54 22.5	5 51 37.5
2d. Dome of the Court House,	43 02 34.6	87 54 25.7	5 51 37.7
3d. Centre of the Court House public square,	43 02 33.4	87 54 25.7	5 51 37.7
4th. The intersection of the middle of Milwaukee Street with the middle of Mason street,	43 02 27.2	87 54 31.4	5 51 38.1

The American Almanac for the present year (1858) gives the position of Milwaukee, as follows, viz.

Latitude,	43° 03′ 45″ N.
Longitude, west Greenwich,	87° 57′ 00″

which, if our determination be correct, is an error in the assigned geographical position of this place, of two and fifty-five hundredths miles (2.55 miles) on an azimuthal course of N. 58° 06′ 19″ W. from the true position.

VI. MADISON, THE CAPITAL OF WISCONSIN.

On the 24th of June I went from Milwaukee to Madison, intending to observe there in the evening, and, if possible, to exchange telegraphic signals with Chicago for determining the difference of longitude. The night was, however, cloudy and rainy, and no observations could be made, either for the time or the latitude.

On the 25th the weather remained somewhat cloudy, and was unsettled until a late hour of the night; so much so, that no signals could be passed by the telegraphic wires. The following observations were, however, made during three-fourths of an hour, at intervals of clear sky, in the early part of the evening, for the time, and after the weather had cleared, at a late period of the night, for the approximate latitude, viz.

1*st. Observations for the Time. Station No.* 1.

At a point 95 feet = + 0″.94 of latitude north of the parallel, and 175 feet = — 0*s*.16 of time east of the meridian of the centre of the dome of the State Capitol.

1858, *June 25th.*

	h. *m.* *s.*
Sidereal chronometer No. 2557, fast:	
By 13 observations on α Lyræ, east (at 15*h*. 43*m*.)	1 06 50.41
By 15 observations on α Bootis, west (at 16*h*. 08*m*.)	1 06 50.43
Result—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 56*m*.) -	+ 1 06 50.42

2*d. Observations for the Latitude of Station No.* 1. *Same Night.*

	° ′ ″
By 19 observed circum-meridian altitudes of α Ophiuchi, south, - - - - - -	43 04 40.9
By 21 altitudes of α Ursæ Minoris (Polaris) north,	43 04 41.5
Result—Latitude of station No. 1 (approximate)	43 04 41.2
Reduction to the dome of the Capitol, - -	— 0.9
Result—Latitude of the State Capitol at Madison, Wisconsin (approximate), - - -	43 04 40.3 N.

Owing to unfavourable weather, the only result of this visit to Madison was the obtaining of the approximate latitude as above given.

On the 19th of July I made another visit to Madison, and returned to Chicago on the evening of the 21st.

Observations for the time, at the Chicago Station No. 2, on the 18th and 21st, will be found among the preceding records.

The night of the 19th was not very favourable for observations at Madison. I was enabled to observe nine altitudes of α Lyræ, east, for the time, but the sky was so cloudy the rest of the night that no observations could be made on a star west for eliminating any small errors that might appertain to the partial result obtained from α Lyræ.

Telegraphic signals were, however, exchanged with Chicago, with a view to obtaining an approximate result for the longitude of Madison in case I should not be able to get a more satisfactory set of time-observations before leaving that place. *

Fortunately such an opportunity occurred on the next night, when, occupying a station (No. 2) immediately in rear of the Baptist church, on Carroll street, between Washington and Morris streets, the following observations were made: From this station, to a point perpendicularly under the apex of the steeple of this church, is N. 45° E. 90 feet; from thence to a point perpendicularly under the centre of the dome of the State Capitol, we ran, first, N. 45° E. 268 feet, and then due north 320 feet. Hence the reduction from this Madison Station No. 2 to the dome of the State Capitol, is, in latitude, + 5″.68, and in longitude—3″.41 in arc,=—0*s*.23 in time.

Observations for the Time at Madison Station No. 2. Approx. Latitude, 44° 04′ 33″.1 N. 1858, July 20th.

Sidereal chronometer No. 2557, fast:

	h. *m.* *s.*
By 8 observations on α Aquilæ (Altair) east (at 17*h.* 05*m.*) - - - - -	1 09 12.95
By 13 observations on α Bootis, west (at 17*h.* 37*m.*)	1 09 15.05
Result—Chronometer No. 2557, fast of sidereal time for this station, No. 2 (at 17*h.* 21*m.*)	+ 1 09 14.

The above result for the time at Madison, combined with the time-observations at Chicago on the nights of July 18th and 21st, and the telegraphic signals passed on the night of the 20th, gives the longitude of Madison as follows, viz.

* *Note.* The approximate time, computed from those observations on α Lyræ, on the night of the 19th, and the telegraphic signals of that night, give, as the approximate longitude of the State Capitol, west of Greenwich, 5*h.* 57*m.* 32*s*.5, which is 0*s*.75 greater than the result adopted from the observations and signals of the night of July 20th.—J. D. G.

Determination of the difference of Longitude between Chicago and Madison, Wisconsin, by electric signals for comparisons of time, July 20th, 1858.

Sidereal Chronometer No. 2557, fast of Madison sidereal time (at 18*h*. 16*m*. sidereal time), + 1*h*. 09*m*. 14*s*.2.

Rate per sidereal day, + 5*s*.39. or per sidereal hour, + 0*s*.2245.

Mean Solar Chronometer No. 141, slow of Chicago mean solar time (at 10*h*. 28*m*. mean time), 104*m*. 42*s*.16.

Rate per mean solar day, + 0*s*.42. or per mean solar hour, + 0*s*.017.

1st.—Chicago signals recorded at both stations.

Times of Signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Madison, Wis. by sidereal Chronometer No. 2557.	Madison correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal. Madison west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 23 40.	10 28 22.16	19 25 10.5	18 15 56.30	18 22 57.12	0 07 00.82
10 26 40.	10 31 22.16	19 28 11.	18 18 56.79	18 25 57.61	0 07 00.82
10 29 40.	10 34 22.16	19 31 11.5	18 21 57.28	18 28 58.10	0 07 00.82
10 32 30.	10 37 12.16	19 34 02.	18 24 47.77	18 31 48.57	0 07 00.80
10 35 40.	10 40 22.16	19 37 12.5	18 27 58.25	18 34 59.08	0 07 00.83

1st Mean.—Electric signals sent from Chicago to Madison, Wis., 0 07 00.818

2d.—Madison, Wisconsin, signals recorded at both stations.

Times of signals given at Madison by sidereal Chronometer No. 2557.	Times of Madison, Wis. signals, as noted at Chicago, by mean solar Chronometer No. 141.	Chicago correct mean solar time of Madison signals.	Chicago reduced sidereal time of Madison signals.	Madison correct sidereal time of Madison signals.	Difference of Longitude by each signal. Madison west of the meridian of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
19 46 15.	10 44 41.	10 49 23.15	18 44 01.56	18 37 00.72	0 07 00.84
19 49 15.5	10 47 41.	10 52 23.15	18 47 02.05	18 40 01.21	0 07 00.84
19 52 16.	10 50 41.	10 55 23.15	18 50 02.54	18 43 01.70	0 07 00.84
19 55 15.5	10 53 40.	10 58 22.15	18 53 02.03	18 46 01.19	0 07 00.84
19 58 15.5	10 56 39.5	11 01 21.65	18 56 02.02	18 49 01.18	0 07 00.84

2d Mean.—Electric signals sent from Madison, Wis. to Chicago, 0 07 00.84

1st Mean.—Electric signals sent from Chicago to Madison, Wisconsin, as above, 0 07 00.818

Result:—Madison Station No. 2, west, in longitude, of Chicago observing station No. 2, by a mean of the two sets of signals, + 0 07 00.83

	h.	m.	s.
Brought forward,	+ 0	07	00.83
Reduction to the dome of the State Capitol,			— 0.23
Dome of State Capitol, west of Chicago Station No. 2,	0	07	00.6
Longitude of Chicago station No. 2, - -	5	50	31.15
Result—Longitude of the dome of the State Capitol at Madison, Wisconsin, west of the meridian of Greenwich, - - - - -	5	57	31.75
Equal, in arc, to - - - -	89°	22′	56″.25
Latitude of the same point (approximate) as before given, - - - -	43°	04′	40″.3 N.

This being a State Capital, the above determination will be verified by further observations, when an opportunity shall occur.

In all the computations of the observations for the time and the latitudes, the Apparent Right Ascensions and Declinations of the Stars have been taken from the British Nautical Almanac for the year 1858.

J. D. GRAHAM,
Member of the Society.

INDEX TO VOL. VI.

Address of the President, 16, 67, 233.
Admission fee, 128, 132.
Adipocire (C. M. Wetherill), 80, 84.
Additions to the Mint Cabinet, 184.
Adamson on measuring portions of time, 237, 243.
—— Dr. introduced, 153.
Alexander (Prof.), of Baltimore, 56.
Aluminium (Dubois), 141, 148, 171.
Alphabet of Lepsius (Haldeman), 187.
Amendment to by-laws, 128, 177, 180.
Apparatus for specific gravity of ores (Eckfeldt), 194, 201.
Arctic exploring expedition, 5, 22, 49, 57, 84, 132.
Arctic plants (Durand), 186.
Astronomical observing fund, 128, 132.
Asteroid discovered, 55.
Augite (Trego), 246.
Australian gold (Dubois, Trego), 184.
Aurora Borealis (Justice, Lea), 162.
,, ,, (Boyé), 163.

Bache (Dr. F.), 58.
Bean's magnetic observations, 39, 41.
Bessel & Schumacher, 57.
Boardman (Dr. Henry), 16.
Board of officers and council, 16, 35, 68, 128, 184, 208, 239.
Bœdæ, new genus (Dr. Hallowell), 186.
Boyé on models of crystal forms, 303.
—— on a remarkable aurora, 155.
—— on human hair, 163.
—— on an apparatus to show heat vibrations, 32.
—— on a stereoscopic daguerreotype, 49.
Brown-Sequard on crystals in dogs' blood, 243.
Budge (Prof.), made correspondent, 56.
By-laws amended, 332, 342.

Camels introduced into America (Wayne), 275.
Carboniferous Limestone fossil fish, 205, 208.
Carlier (Mons.), 153.
Carpenter's square (R. E. Rogers), 169, 181.
Chase on English-Sanscrit analogues, 324.
Chicago longitude, &c. (Graham), 312.
Charts of the Arctic regions, Lady Franklin's, 22, 84.
Cicindelæ revised (Le Conte), 175, 176.
City fund for an observatory, 128, 132.
Coinage (Peale), 95, 106.
Coins loaned to Dr. Morris, 139, 143.
—— of Japan, 184.
—— of aluminium, 171.
Committee, historical and literary, 26.
Comet of 1858 (Justice), 328.
,, ,, ,, (Zantedeschi), 333.

Committees:—
Standing Committees appointed, 5, 81, 172, 234, 284.
Finance, 64, 66, 153, 164, 165, 212, 213, 228, 230, 279, 280, 344, 346.
Publication, 9, 64, 164, 175, 208, 228, 237, 260, 273, 279, 298, 304, 344.

—— Special:—on
Names of officers for the election of 1859, 345, 346.
Library and Hall, 8, 26, 33, 35, 41, 47, 51, 56.
Sale of Hall, 81, 85, 118, 124, 137, 139, 143, 145, 180, 182, 184, 216, 254, 257, 302, 304.
Purchase of Hall, 258, 260, 262, 269.
Revision of by-laws respecting

Treasurer and Librarian, 298, 303, 304, 306, 307.
Conference with Phil. Lib. Com., &c., 302, 304.
Geological collection, 248, 251.
Seal of the Society, 128, 132.
Geological Survey, 119, 121.
Solar Eclipse of 1854, 35, 38.
Astronomical observations, 132.
Kane's expedition, 58, 64, 84, 131, 151, 153, 154, 162, 175, 186, 205, 240, 246.
Hayes' expedition, 316, 317, 320, 326, 328.
Michaux legacy, 211, 215, 219, 263, 329, 344.
Michaux obituary, 222, 230, 243, 247.
Portrait of E. K. Kane, 246, 248, 254.
Portrait of J. K. Kane, 304.
Portrait of Dr. Chapman, 301,
Paper on Adipocire, by C. M. Wetherill, 80, 84.
Paper on Megalonyx, by Jos. Leidy, 230, 233.
Paper on measuring time, by J. C. Adamson, 237, 243.
Paper on electricity, by Zantedeschi, 278, 280.
Paper on Cicindelæ, by Le Conte, 177.
Paper on Boædæ, new genus, by Dr. Hallowell, 184.
Paper on Scincidæ, by Dr. Hallowell, 200, 205.
Paper on the Walrus, by Dr. Leidy, 201, 205.
Paper on Carb. Lime. fishes, by Leidy, 205, 208.
Paper on extinct Peccary, by Leidy, 221, 222.
Paper on Saurocephalus, by Leidy, 221, 222.
Paper on English-Sanscrit analogues by Chase, 324, 326.
Contributions to geography by Graham, 347.
Coolidge (Mrs.), 172.

CORRESPONDENCE with INDIVIDUALS.
Adamson, 228.
Allen, W. H., 308.
Allen, 173.
Angelis (de) 113.
Arfwedson, 2.
Bache, 82, 241.
Baikie, 206.
Baird, 82.
Balbo, 6.
Barnes, 151.
Boardman, 247.
Bossange, 185.
Brown, 185.
Brown-Sequard, 119.
Burmeister, 216.
Chevalier, 143.
Cohen, 27.
Copello, 252.
Coppeé, 173.
Cresson, 252.
Cuyler, 235.
Dana, 45.
Dewitt, 176.
Dohrn, 54.
Dunglison, 318.
Durand, 27.
Finley, 173.
Finley, 182.
Field, 180.
Frazer, 316.
Genth, 9.
Gibbs, 45.
Goddard, 252.
Grigsby, 255.
Gross, 9.
Graham, 287, 309.
Haidinger, 156.
Hallowell, 6.
Harding, 6.
Harris, 216.
Harris, 236.
Hartshorne, 330.
Hayes, 309.
Hollingsworth, 188.
Horsfield, 324.
Humphreys, 279.
Jahn, 35.
James, Col. H., 332.
Jomard, 345.
Kane, 173.
Kennedy, 9.
Kneass, 173.
Lacordaire, 209.
Lambden, 202.
Latrobe, 6, 36.
Lenox, 27.
Lesley, 212.
Letchworth, 173.
Lewis, 133.
Leyburn, 206.
Loosey, 324.
Mahon, 35.
Malherbe, 324.
Manzini, 309.
Martius (von), 129.
Matile, 173.
Maury, 54.
Meigs, 6.
Miller, 263.
Morris, 139.

Morton, 252.
Neumann, 133.
Paget, 19.
Patterson, 120.
Powel, 12, 123.
Price, 27.
Purgstall, 23, 129, 203.
Rand, 252.
Rehrer, 244.
Rogers, 235.
Rogers, 140.
Rogers, 123.
Ruschenberger, 50.
Samuel, 206.
Saunders, 209.
Shurtleff, 23, 113.
Shurtleff, 129, 247.
Short, 185.
Smith, 254.
Smith, C. E., 330.
Stanley, 131.
Stevens, 9.
Swallow, 187.
Sully, 217.
Temminck, 290.
Thomas, 188.
Uhler, 330.
Vandyke, 137.
Vriese, 65, 129.
Wagner, 261.
Wayne, 284.
West, 6.
Wilkes, 273.
Williams, 23.
Yandell, 127.
Zantedeschi, 82, 264, 266, 276, 290, 309, 325, 333, 343.

CORRESPONDENCE with learned SOCIETIES abroad.
Austria :—
Imperial Acadamy at Vienna, 23, 35, 58, 125, 129, 133, 168, 197, 208, 221, 271, 285, 304.
Geological Institute at Vienna, 23, 45, 47, 129, 156, 197, 221, 249, 317.
Geographical Society at Vienna, 324.
Belgium :—
Royal Academy at Brussels, 52, 270.
Central Commission of Statistics, 9, 280.
Denmark :—
Royal Society at Copenhagen, 58, 145, 249, 304.
Society of Northern Antiquaries, 156.
Literary Society of Funen, Odense, 48.
England :—
Bath and West of England Society, 173, 343.
Cornwall R. Geographical Society, 36.
Cambridge Philosophical Society, 54, 264.
Leeds Philosophical Society, 153, 308.
London Ethnological Society, 125, 145, 203, 255.
Geological Society, 70, 178, 285.
Horticultural Society, 65, 298.
Linnean Society, 125, 173, 244.
Royal Society, 45, 125, 198, 285, 322.
R. Asiatic Society, 82, 164, 283.
R. Geographical Society, 22, 145, 156, 213, 217, 264, 322.
Royal Institution, 23, 228.
R. Observatory, Greenwich, 267, 317.
Society of Antiquaries, 54, 82, 145, 173, 241, 273.
Soc. of Arts, Man. & Com., 156, 228, 283.
Statistical Soc., 182, 228.
Zoological Society, 82, 153, 156.
Manchester Lit. & Phil. Soc., 156, 164, 325.
Northumberland N. H. Soc., 156, 164, 241, 285.
France :—
Abbeville Imp. Soc. Emulation, 287.
Dijon Acad. of Arts, Sciences & B. L., 304.
Lille Imp. Society of Sciences, 119.
Paris Ecole des Mines, 21, 45, 49, 209, 221.
Geographical Society, 119, 308.
Strasburg Museum of Nat. Hist., 45, 325.
Germany :—
Bavaria: Royal Academy at Munich, 36, 58, 125, 133, 198, 202, 213, 255, 318.
Prussia: Royal Academy at Berlin, 65, 168, 221, 317, 343.
Association for promoting Horticulture, 54, 198, 308.

Altenburg Natural History Society, 255.
Emden Natural History Society, 244, 255.
Göttingen Royal Society, 133, 198, 235, 264, 343.
Nat. Hist. Soc. Rhenish Prussia, Bonn, 58, 156, 278.
Upper Lusatian Society, 133, 137.
Saxony: Royal Society, 35, 76, 133, 145, 182, 249, 255, 304, 343.
Prince Jablonowski Soc. at Leipsig, 36, 156.
Ireland:—
Dublin University Zool. & Bot. Ass., 228, 230.
Italy:—
Royal Academy at Turin, 113, 304, 343.
Royal Lombardy Institute at Milan, 145, 304.
Imp. Royal Institute at Venice, 133, 137.
Netherlands:—
Royal Academy at Amsterdam, 19, 65, 82, 156, 198, 255, 308.
Royal Zoological Society at Amsterdam, 17, 317.
Holland Society at Haarlem, 54.
Geological Commission at Haarlem, 85.
Batavian Society at Batavia, 51, 125, 129, 283, 318.
Norway:—
Royal University at Christiania, 308.
Russia:—
Imp. Society of the Naturalists of Moscow, 23, 140, 145, 151, 156, 181, 197, 255, 304, 317.
Imp. Mineralogical Soc. at St. Petersburg, 137.
Physical Central Observatory at St. Petersburg, 198, 271, 343.
Corps of Mining Engineers at St. Petersburg, 9, 125, 197, 235, 317.
Society of Naturalists at Riga, 304.
Scotland:—
Royal Society at Edinburg, 282.
Society of Antiquaries at Edinburg, 208, 285.
Spain:—
Royal Academy at Madrid, 213.
Sweden:—
Royal Academy at Stockholm, 22, 23, 145, 235, 285.
Royal Society at Upsal, 133, 221, 255, 343.

CORRESPONDENCE with learned SOCIETIES at home.
American Antiquarian Society, 45, 86, 129, 176, 238, 299.
Massachusetts Historical Society, 244, 267, 304, 329.
American Academy at Boston, 23.
Boston S. N. H., 21, 119, 123, 133, 209, 255, 283, 309.
Boston Athenæum, 178, 206.
Harvard College at Cambridge, 21, 23, 48, 100, 133, 206, 273, 299.
Bowditch Library at Boston, 140, 282.
Connecticut Historical Society, 17, 43, 45, 82, 133, 176, 206, 238, 273, 298, 325.
Yale College at New Haven, 176, 217, 252, 276, 302, 325.
New Jersey Historical Society, 9, 45, 85, 129, 176, 206, 238.
New York Historical Society, 54, 238.
New York State Library, 16, 45, 82, 133.
New York Lyceum N. H., 17, 50, 182, 287, 302.
Pennsylvania Historical Society, 9, 45, 133, 173, 212, 238, 273.
Academy Nat. Sciences at Philadelphia, 9, 43.
Rhode Island Historical Society, 129.
Washington; Smithsonian Institution, 104, 178, 244, 273.
Bureau of the Coast Survey, 70.
Department of State, Washington, 133, 209, 217, 329.
Elliott Society of N. H. at Charleston, 202.
Academy of Sciences at St. Louis, 198, 202, 249, 274, 325.
Wisconsin Historical Society, 33, 35, 36, 41.
Cresson on the temperature of the Moon, 239.
Crystal's in dogs' blood (Brown-Sequard), 243.
Crystal forms in model (Boyé), 308.

Daguerreotype Stereoscopic (Boyé), 49.

Dehaven's Arctic Chart, 85.
Delaware vocabulary lent, 56.
Dogs' blood crystals (Brown-Sequard), 243.
Donations to the Library, 330.
Dubois on Aluminium, 141, 148.
—— on Turkish paper money, 154, 214.
—— on silver ore, 155.
—— on native California gold, 257.
—— on additions to the Mint Cabinet, 184.
Dunglison's visit to Europe, 20.
—— on nature printing at Vienna, 49.
—— on the conflagrations of buildings, 144.
—— on supra-renal capsules, 243.
Duponceau's Essay on Chinese writing, 121.
Durand on Arctic plants, 186, 187,

Earthquake in Baltimore, 137.
Eclipse, solar, 35, 38.
Eckfeldt & Dubois on aluminium, 148.
—— on apparatus for specific gravity of ores, 194, 201.
Elections of officers and council, 1, 69, 167, 231, 281.
Electricity (Zantedeschi), 278, 280.
Electrical machines (Rogers), 273.
Emerson on the first snow-storm of 1856, 181.
—— on Chinese sugar cane, 283.
Engraving on tin-plates (Justice), 165.
Euphrosyne, 55.
Exchanges, value to the library, 330.
Exploring expeditions, Kane's, 5, 22, 49, 57, 84, 132.
—— Hayes', 316, 317, 320, 326, 328.

Fire escape (Peale), 118.
Fireproof buildings, 144.
Flux, magnesian, for iron melting, 246.
Foulke on Hugh Miller's remarks, 253.
Franklin (Lady), 85.
Frazer's visit to Europe, 124.
Fund for observatory, 128. 132.
Fungus from New Jersey (Justice), 213, 219.

Geography, contributions to (Graham), 347.
Geological survey of Pennsylvania, 119, 121.
Glendon iron furnace slags (Trego), 246.
Gold from California (Dubois), 257.
Gold in quartz, 184.
Graham on the lon. & lat. of Chicago, 312.
—— Contributions to Geography, No. 1, 347.
—— ditto. No. 2, 352.
Guano, Columbian (Trego), 189.

Haldeman on Lepsius' alphabet, 187.
Hall, original subscription, (1786), 246.
Hall (see Committees, special).
Hallowell on a new genus of Bosedæ, 186.
—— on new, rare species of Scincidæ, 200, 205.
Hansteen medal, 311.
Harris on subjects for discussion, 239.
Haverford observatory telescope (Justice), 227.
Heat vibrations (Boyé) 32.
Historical & Literary Committee, 26.
Human hair (Boyè), 163.

Ice-bergs in the Atlantic, 175.
Ice-belts of the Arctic regions, 22.
Interest of the meetings; how it may be increased? 239.
Iroquois grammar, 26.
Itzebue, 184.

Japanese coin, 184.
Japan medal to Com. Perry, 184.
Jefferson's portrait, 172.
Justice & Trego's observations on the Eclipse, 40.
Justice on concussional loss of sense, 51.
—— resigned from Committee on the Hall, 51.
—— on tin-plate engraving, 165.
—— on a dried fungus from New Jersey, 213.
—— on the Haverford telescope, 227.
—— on microscopic photographs, 234.
—— on photographs of the moon, 237, 239.
—— on paraffine, &c., 320.
Kane (J. K.), 22, 35, 57, 132, 289, 290.
Kane (E. K.), 5, 22, 49, 57, 84, 132, 175.
—— on Arctic plants, 186.
—— on Arctic thermometric observations, 188.
—— on the Arctic aurora, 155.
Kane's medal, 205.
Kendall & Frazer's solar observations, 40.
Kendall (see Bessel & Schumacher), 57.

Lambden, J. R., 202.
Lea on auroras, 162.
Lenox, James, 16.
—— on a Honduras Lycopodium, 287.
Leconte on Cicindelæ, 175, 176.

—— on a dried fungus from New Jersey, 219.
—— on photographs of the moon, 239.
Leidy on the Walrus of the U. S., 201, 205.
—— on Carboniferous Limestone fossil fish, 205, 208.
—— on the extinct peccary, 221.
—— on saurocephalus, 221.
—— on Megalonyx foot, 230, 233.
Lepsius' alphabet (Haldeman), 187.
Lesley on the insensible gradation of words, 317.
—— on lepidostrobus and polished coal-slate, 323.
—— on Rehn's photo-lithography, 328.
—— elected Librarian, 284.
List of surviving members, 5, 81, 172, 234, 284.
Longstreth's solar observations, 39.
Lycopodium from Honduras (Leconte), 287.

Magellanic premium, 128, 166, 239.
Medal to Dr. Kane, 205.
Megalonyx foot (Leidy), 230, 233.
Members surviving, lists on pages 5, 81, 172, 234, 284.
Members elected:
Adamson, J. C., 206.
Allen, W. H., 308.
Allen, George, 173, 176.
Baird, S. F., 81.
Barnes, Albert, 151, 153.
Betton, T. F., 234, 257.
Brown, J. P., 173.
Brown-Sequard, E., 6, 241.
Burmeister, H., 188.
Cohen, Josh. I., 26.
Coppee, Henry, 173.
Cresson, C. M., 252, 257.
Cuyler, Theodore, 234, 237.
Dana, James D., 44.
Dohrn, C. A., 6.
Durand, Elias, 26, 27.
Felton, S. M., 6.
Field, H. W., 173.
Finley, C. A., 173.
Foulke, W. P. 54.
Genth, Fred. A., 6.
Gerhard, Benj'n., 26, 47.
Gillou, Constant, 26, 43.
Gibbs, Walcott, 44.
Goddard, Kingston, 252, 257.
Grigsby, H. B., 206.
Gross, S. D., 6, 212.
Haidinger, W., 81.
Hall, James, 44.
Hallowell, Benj'n., 6.
Harding, George, 6, 16.
Hartshorne, E., 330, 345.
Harris, R. P., 216.
Herschell, Sir. J. F. W., 6.
Hollingsworth, 188, 191.
Humphreys, A. A., 273.
James, T. P., 234, 237.
Kane, T. L., 173.
Keating, W. V., 26, 27.
Kneass, Strickland, 173.
Lacordaire, Theo., 188.
Latrobe, J. H. B., 6.
Lenox, James, 26.
Letchworth, A. S. 173, 176.
Lesley, J. P., 206, 212.
Leyburn, John, 206.
Lewis, E. J., 121, 132.
Lombardini, Elia, 284.
Mahon, Lord, 26.
McCall, Col. G. A., 6.
Martius (von), C. F. P., 81.
Matile, G. A., 173, 176.
Meigs, Capt. M. C., 6.
Miller, E. S., 263.
Mordecai, A., 258.
Morton, H. J., 252.
Olrick, Christian, 188.
Paget, James, 6.
Powel, Samuel, 121, 164.
Price, Eli K., 26.
Rand, B. H., 252, 254.
Reed, W. B., 173.
Regnault, V., 81.
Renard, Ch., 6.
Rogers, E. P., 121, 123.
Rogers, R. E., 138, 143.
Rogers, Fairman, 234, 237.
Shurtleff, N. P., 234.
Smith, C. E., 330.
Stanley, Ed., 6.
Stevens, W. B., 6.
Uhler, W. M., 330.
West, Francis, 6.
Wayne, H. C., 284.
Members deceased:
Barton, W. P. C., 179.
Bailey, J. W., 246, 251.
Beck, T. R.. 162.
Biddle, C. C., 141, 158.
Biddle, Thos., 260.
Bird, R. M., 8, 11, 50.
Bonaparte, Jos. 71, 332.
Bonaparte, C. L., 266.
Caldwell, C., 77, 128.
Campbell, G., 131.
Cauchy, Baron, 260.
Chapman, Nat., 301.
Cheves, Langdon, 263.
Cleveland, Parker, 332.
Collyer, W. B., 118.
Cope, T. C., 64.
Courtenay, E. H., 4.
Crelle A. L., 320.

Davis, I. R., 236, 299.
Dillingham, W. H., 66, 91.
Drake, Daniel, 56.
Fisher, Gotthelf, 20.
Flügel, J. G., 137.
Gauss, C. F., 119, 125.
Gibson, J., 205.
Gilpin, T., 11, 13.
Hall, M., 269.
Hare, R. M., 317, 324.
Hopkinson, Judge, 3, 12.
Kane, J. K., 289.
Kane, E. K., 240, 243, 246, 247, 248.
Locke, John, 205.
Ludlow, John, 269.
McIlvaine, W., 47, 101.
McLane, L., 273.
McEuen, C., 278.
Michaux, A., 211, 222, 230.
Mitchell, J. K., 306, 340.
Mercer, C. F., 311.
Morris, J. G., 56.
Mower, T. G., 5.
Müller, Johannes, 321.
Nagy, Chas., 312.
Naxera, M. de, 312
Patterson, R. M., 49, 60.
Peter, Wm., 115.
Purgstall Von H., 237.
Rawle, Wm., 323.
Redfield, W. C., 239.
Reed, Henry, 56, 87.
Reid, Col. Wm., 344.
Rogers, J. B., 228.
Short, W., 185, 188.
Strickland, W., 26, 28.
Thompson, J. G., 26.
Tyson, Job R., 321.
Vanderkemp, J. J., 162.
Vaughn, Petty, 84.
Ware, N. A. 5.
Warren, J. C., 193.
Wetherill, 11, 14.
Wharton, T. I., 186.
Wylie, Sir. J., 22.
Yarrell, W. 230.
Memorial to Congress, 58, 64.
Memorial to the Penna. Legislature, 119.
Michaux bequest (see Committees), 211.
Microscope for the Society, 186.
Mint Cabinet, 184.
Miller (Hugh) Testimony of the Rocks (Foulke), 253.
Moon, photographed; temperature, 239.
Morris (Dr. Casper), loan of coins to, 139.
Mortgage held by the Society, 153.
Nature printing in Vienna (Dunglison), 49.
Nervous sensibility, its limits (Zantedeschi), 291.
New York Historical Society Centennial An. 56, 58.

Obituary notices, see members deceased.
Obituary notices prior to 1854, 182.
Ozone, Schönbein's scale (R. F. Rogers), 177.

Paraffine and other oils (Justice), 320.
Patterson (R. M.), portrait copied, 180.
Peale on a skater's reel, 179.
—— on coinage, 97, 106.
—— on a fire escape, 118.
—— on a new form of valve, 243.
—— on preserving fruit, &c., 219.
Perry's Japan medal, 184.
Photographs, microscopic (Justice), 234.
—— of the moon, 237, 239.
Photo-lithography of Rehn's process (Lesley), 328.
Polarized light of Donati's comet, 333.
Portraits (see Committees, special).
Portrait of Jefferson, 211, 220, 172.
Portrait by Lambden, 202.
Portrait of R. M. Patterson, 180.
President's election, laws amended, 332, 342.
Preserving vegetables (Peale), 219.
Proceedings issued, 9, 44, 85, 237, 260, 298, 325.
Pyroxene, (Trego), 246.

Randall (H. S.), 172.
Rehn's photo-lithography, 328.
Resolutions in behalf of the Smithson. Inst. 104.
Right of membership within ten miles, 132.
Rogers (R. E.), on the Carpenter's square, 169, 181.
—— on Schönbein's ozone scale, 177.
—— on disinfecting and bleaching ozone, 177.
—— on an electrical machine, 273.
—— on water in contact with hot surfaces, 346.

Sanscrit synonyms (Chase), 324.
Salary of Librarian increased, 177, 180.
Sale of Hall (see Committees, special),
Saunders; portrait of Jefferson, 211.
Scincidæ, new species, (Hallowell), 200, 205.

Scott's map of Philadelphia, 143.
Seal of the Society, 10, 128, 132.
Senses of taste and smell destroyed by concussion, 51.
Silver ore (Dubois), 154.
Silver coin of Japan, 184.
Silver piece, Chinese (Leconte), 320.
Skater's reel (Peale), 179.
Smithsonian Institution resolutions, 104.
Snow-storm (Emerson), 181.
Solar eclipse, 35, 38.
Sorghum (Emerson & others), 283.
Specific gravity of ores; apparatus, 193, 201.
Sully, portrait of Jefferson, 220.
" " of R. M. Patterson, 180.
Surviving members' list, 5, 81, 172, 234, 284.
Supra-renal capsules (Dunglison), 243.

Telegraphs, electric (Zantedeschi), 266.
Thermometers, 188.
Tin-plate engraving (Justice), 165.
Treasurer & Librarian; by-laws revised, 288, 298.
Trego on Glendon iron slags, 246.
—— on Columbian Guano, 189.
—— on Australian gold, 184.
—— elected Librarian, 5, 80, 172, 234.
Trübner's offer to purchase Duponceau's essay, 121.
Turkish paper money (Dubois), 154, 214.

Valve, new form of (R. Peale), 243.
Vibrations of heat (Boyé), 32.
Voyages of De Vries, 16.

Wagner furnished with letters, 211.
Wagner and Riggs' solar observations, 38.
Walrus of the U. S. (Leidy), 201, 205.
Wayne on the camel in America, 275.
Wild, Associate Sec. Roy. Soc. introduced, 51.
Wisconsin, H. Soc. correspondence, 41.
Williams (Rev. E.), Iroquois grammar, 26.
Words, insensible gradation of (Lesley), 317.
Wylie (Sir. Jas.), autobiography, 22.
Wygandt's vibrations of heat (Boyé), 32.

Zantedeschi on the telegraph, 266.
—— on the limits of nervous sensibility, 291.
—— on electricity, 278, 280.